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United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

SEP 23 2008

H1817(2265)

Memorandum

To: Directorate and Field Directorate
Attention: Park Superintendents and Center Managers

From: Associate Director, Cultural Resources *Janet Snyder Matthews*

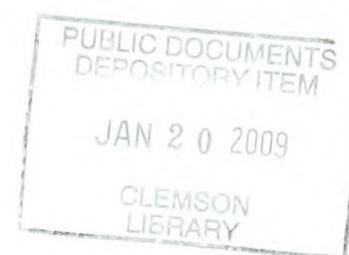
Subject: Issuance of Revised NPS *Museum Handbook* Part II, Appendix D: Museum Archives and Manuscript Collections

Attached is the latest revision of NPS *Museum Handbook* Part II, Appendix D: Museum Archives and Manuscript Collections.

Drafted by WASO Park Museum Management Program staff, the new text underwent rigorous Service-wide review and external peer review by archives professionals. The document was strengthened using edits that were suggested by the reviewers.

Park staff should find this updated version of Appendix D easier to read and to use. Please remove the previous version and insert the updated document in the proper position in the *NPS Museum Handbook* Part II binder.

Attachment



N
B - 375

see 6-2

FULL SIZE CHECKLIST

- This full size Checklist for Evaluating Scope of Collection Statements is for your use.
- Save as a master set.
- Copy as needed.

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

Unit's Name: _____

Draft _____ Approved _____ Date: _____

Reviewed by: _____ Date: _____

	YES	NO
A. Does the SOCS have <i>TITLE PAGE</i> ?	____	____
1. Is Title Page format correct? [MH-I,2:6]	____	____
2. Does Title Page include all required signatures and dates?	____	____
B. Does the SOCS have <i>INTRODUCTION</i> section?	____	____
1. Is purpose of SOCS stated? [MH-I,2:5]	____	____
2. Are NPS legal authorities (laws) to acquire and preserve museum objects cited? [MH-I,2:5&7]	____	____
3. a. Is unit's mission stated? b. Is unit's enabling legislation cited? c. If applicable, is subsequent unit's legislation cited?	____	____
4. If applicable, is there a statement indicating that museum collection is mandated by unit's enabling or subsequent legislation?	____	____
5. <i>Unit's Interpretive Themes</i> : a. Are interpretive themes listed? b. Are interpretive periods listed? c. If available, are appropriate planning documents (title/date) cited?	____	____
6. <i>Unit's Resource Management Goals and Objectives</i> : a. Are pertinent cultural and natural resource management goals and objectives listed? b. If available, are appropriate planning documents (title/date) cited?	____	____
7. <i>Mandated Collections</i> : a. Is statement, citing <i>43 CFR 7.13</i> and <i>NPS Management Policies</i> (Dec 88), pp. 5:3-4, made that archeological collections are managed as part of the unit's museum collection? [MH-I,2:8] b. Is statement citing <i>36 CFR 2.5g</i> made relevant to curatorial requirements for natural history specimens collected by approved permits? [MH-I,2:8]	____	____
8. Is there a discussion of the significance and history of the collection (optional)?	____	____
9. Are other laws, regulations, conventions, and special directives relevant to acquisition of museum objects cited? [MH-I,2:8-9]	____	____
10. If applicable, are any special unit designations (e.g., MAB Reserve, National Historic Landmark, World Heritage Site) that may be pertinent to museum collection cited?	____	____

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	<u>YES</u>	<u>NO</u>
C. Does the SOCS have <i>TYPES OF COLLECTIONS</i> section?		
1. Is there a brief profile of the unit's museum collection? [MH-I,2:9-10]		
2. Is there an introductory statement indicating that INTRODUCTION section states purpose of collection?		
3. Is section divided into two major categories: Natural History Collection and Cultural Collection?		
4. <i>Natural History Collection Category:</i>		
a. If appropriate, is there a statement that the unit does not collect/maintain a natural history collection for its own purposes?		
b. If unit collects/maintains a natural history collection is there an introductory paragraph that briefly outlines the purpose of this collection? [MH-I,2:10-11]		
c. Is major category subdivided into disciplines (Biology, Geology, Paleontology) pertinent to unit?		
d. Is each discipline subdivided into collecting categories that reflect unit's purpose for collection?		
e. If appropriate, under each collecting category:		
1) Is current representation of object types described?		
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?		
3) Are limits (quantities) defined?		
f. Is there a collecting category for "associated records," under each discipline?		
g. Does paleontology discipline include a statement relevant to "uncontrolled surface" collecting?		
5. <i>Cultural Collection Category:</i>		
a. Does introductory paragraph include a statement that describes the purpose of this collection? [MH-I,2:11-12]		
b. Does introductory paragraph state that an object or archival and manuscript collection from site or directly associated to person(s) or event(s) commemorated by the unit is more desirable than a similar object without such primary association?		
c. Is major category subdivided into disciplines pertinent to the unit (Archeology, Ethnology, History, Archives)?		
d. Is each discipline subdivided into collecting categories that reflect the unit's purpose for collection?		
e. If appropriate, under each collecting category:		
1) Is current representation of object or archival types described?		
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?		
3) Are limits (quantities) defined?		
f. Does archeology discipline include collecting categories for "artifacts and specimens" and "associated records"?		
g. Does archeology discipline include a statement relevant to "uncontrolled surface" collecting?		

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	<u>YES</u>	<u>NO</u>
D. Does the SOCS have <i>MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990</i> section?	—	—
1. Does section contain appropriate statement regarding the required summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony? [MH-I,2:20-21]	—	—
2. Does section contain appropriate statement regarding the required inventory of human remains and associated funerary objects? [MH-I,2:21]	—	—
E. Does the SOCS have <i>ACQUISITION</i> section? [MH-I,2:21-22]	—	—
1. Is there a statement describing types of potential acquisition sources?	—	—
2. Does section include statement that acquisition of objects is governed by park's capability to preserve its museum collection in accordance with NPS <i>Management Policies</i> (Dec 88), NPS-28, Special Directive 80-1, and NPS <i>Museum Handbook</i> , Part I (Sep 90)?	—	—
3. Is there a statement that discourages gifts with restrictions or limiting conditions?	—	—
4. In accordance with NPS-44, Chapter 10, does section state that the acquisition of all firearms and ammunition, except those recovered from field collections, must be reviewed and approved by the SSO curator?	—	—
5. Does section state that acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review prior to acceptance by SSO curator and law enforcement specialist?	—	—
6. Does section state that museum objects must be acquired, accessioned, and cataloged in accordance with NPS <i>Museum Handbook</i> , Part II?	—	—
7. Is there a statement regarding delegation of authority to the unit's superintendent to accept title to and responsibility for museum collections?	—	—
8. Does this section outline any unit-specific acquisition procedures that supplement NPS policies?	—	—
F. Does the SOCS have <i>USES OF COLLECTIONS</i> section? [MH-I,2:23]	—	—
1. Is there a description of desired and acceptable uses?	—	—
2. Is there a statement regarding conservation as a primary consideration when determining uses?	—	—
3. In accordance with the NPS <i>Management Policies</i> (Dec 88), Chapter 7, page 5, "Interpretation and Native Americans" does section state that unit shall not place skeletal or mummified human remains, grave goods or other objects considered sacred on display?	—	—
4. Is there a statement regarding access to museum collection?	—	—
5. Does section reference NPS-28 and NPS-6 relevant to potentially consumptive uses of museum objects?	—	—
6. Does section reference NPS-28 relevant to research/destructive analysis of museum objects?	—	—

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	YES	NO
G. Does the SOCS have <i>RESTRICTIONS</i> section? [MH-I,2:23-24]		
1. Does section include a statement regarding consultation with Tribal governments, Native Hawaiian organizations, Alaskan Native Corporations, and traditional religious leaders? [MH-I,2:24]		
2. Does section state NPS policy relevant to disclosure of information on location, nature, and character of archeological resources?		
3. Does section state NPS policy relevant to keeping confidential identities of community consultants and information about sacred and other culturally sensitive places and practices?		
4. Is there a statement regarding use of objects subject to copyright?		
5. If appropriate, is there a statement relevant to the collecting of endangered, threatened, or rare species?		
6. Does section identify any legal restrictions on disposition or uses of the unit's museum collection?		
H. Does the SOCS have a <i>MANAGEMENT ACTIONS</i> section? [MH-I,2:25]		
1. Are there statements that require the following:		
a. Periodic review of SOCS?		
b. SOCS remains supportive of and consistent with unit's mission?		
c. Unit superintendent's approval of any revisions to SOCS?		
2. Does section document existence of or need for a Collection Management Plan?		
3. If any collections are located outside the unit's boundaries, is brief description of each collection and name and location of each repository identified?		
I. <i>Comments/Recommendations</i> (If needed, attach additional pages.):		
___ See attached copy of unit's approved or draft Scope of Collection Statement for editorial comments.		
___ Determine information needed to evaluate questions answered by "ND" ("Not Determined").		
___ Revise the SOCS to correct the deficiencies noted in the checklist. See NPS <i>Museum Handbook</i> , Part I, Chapter 2, Scope of Museum Collections (1994), Section C for guidance on writing a Scope of Collection Statement.		

FULL SIZE VISITOR LOG

- This full size visitor log and conditions for access to museum collections are your use.
- Save as a master set.
- Copy onto acid-free paper as needed.

VISITOR LOG

By signing this visitor log I acknowledge that I have read and agreed to conditions listed on the reverse of this log.

**U.S. Department of the Interior
National Park Service**

CONDITIONS FOR ACCESS TO MUSEUM COLLECTIONS

1. Access to collections and/or to a secure area by researchers is by appointment. Any limitations imposed on access due to collection conditions, staff availability, and security considerations must be imposed equally on all users, including park staff's personal research. Persons needing to have access are urged to make their requests known to the Superintendent or designee as far in advance as possible.
2. Prospective visitors should be aware that the park staff is extremely busy at certain times of the year and that authorized staff may not be available to assist them at those times. Accordingly, it is suggested that persons needing access make an appointment and be prepared to discuss alternative times with the staff when they submit their requests.
3. The park's decision to allow access may depend upon the condition of the materials, the availability of space for the requester to work, and appropriate supervisory staff. The park keeps space and staff available for visiting researchers.
4. The park requires registration of all researchers (including those inquiring through the mail, on the phone, or Internet). Registration information needs to include full name, address, telephone number(s), institutional affiliation, research topic and publication plans. This information must be updated yearly to remain valid. A valid picture identification card must be shown at the time of the visit. All materials requested by the user are recorded.
5. All non-staff visitors and all staff visitors who are not designated as authorized staff will be accompanied at all times by authorized staff when in museum collection storage areas, when working in open exhibits, or when working with original museum and archival materials.
6. All visitors must sign in and out of museum collection storage area(s) and reference/study rooms on the park's "Visitor Log."
7. Smoking, drinking, and eating are prohibited in collection storage and work spaces and reference/study rooms. Suitcases, briefcases, overcoats, plants, and animals, except guide dogs, are not allowed in collection storage and study areas. Researchers must use pencils/paper or portable computers for taking notes.
8. All guidelines for handling objects and archival and manuscript materials must be read and signed by all collection users, whether staff or non-staff. These guidelines are published separately and may be requested in advance of a visit. A copy of the guidelines also will be provided to each user at the time he/she arrives.
9. The park reserves the right to the following as a condition for granting access to the collections:
 - a. The researcher must agree to abide by any copyrights and state privacy and publicity legislation as well as duplication, publication, and citation policies.
 - b. The park, as a courtesy, requests two copies of completed research papers; publications; CD-ROMs; screen captures of World Wide Web work, derived from work on the collections, or which contain photographs of objects in the collections or copies of documents in the archival collections. Copies of formal reports and other published materials shall be provided at the researcher's expense. Copies of drawings, photographs, and other products of research shall be provided at the researcher's expense, except when doing so constitutes an economic burden, in which case the Superintendent can elect to defray those costs or waive the requirement for the researcher to provide the materials.



FULL SIZE CONDITION CHECKLIST

- This full size Condition Checklist for Visual Images is for your use.
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- Copy as needed.

US Department of the Interior
National Park Service

Condition Checklist For Visual Images

Control Numbers:

Accession number(s) _____
Catalog number(s) _____
Item number(s) _____
Negative number(s) _____

Collection Name: _____

Location(s) of the Item(s) in the Collection:

Box number(s) _____
Folder number(s) _____
Item sequence number _____
Other number _____

Photographer(s): _____

Dates: _____

Physical Description:

Process(es) _____

Format(s) _____

Size(s) _____

- | | |
|--|-------------------------------------|
| <input type="checkbox"/> Color | <input type="checkbox"/> Monochrome |
| <input type="checkbox"/> Negative Transparency | <input type="checkbox"/> Print(s) |
| <input type="checkbox"/> Positive Transparency | <input type="checkbox"/> Drymounted |
| <input type="checkbox"/> Matted <input type="checkbox"/> Framed <input type="checkbox"/> Cased | <input type="checkbox"/> In Album |
| <input type="checkbox"/> Autographed | <input type="checkbox"/> Other |

General Condition Analysis:

Excellent Good Fair Poor

Specific Condition Analysis: (Check all that apply and indicate approximate quantities or percentages when dealing with large quantities)

a. Primary Support/Secondary Support:

- Brittleness _____
 - High acidity _____
 - Lignin content _____
 - Cockling/buckling _____
 - Curling _____
 - Folds/creases _____
 - Wrinkles _____
 - Warp _____
 - Tears _____
 - Losses _____
 - Holes _____

- Tack holes/punctures _____
 - Adhesives _____
 - Tapes _____
 - Discoloration _____
 - Waterstains _____
 - Matburn _____
 - Foxing _____
 - Mold _____
 - Insect/vermin accretions _____
 - Dirt/grime _____
 - Fingerprints _____

Condition Checklist For Visual Images

b. Image Layer/Media:

- | | |
|---|--|
| <input type="checkbox"/> Fading _____ | <input type="checkbox"/> Emulsion bubbling or flow _____ |
| <input type="checkbox"/> Color shift _____ | <input type="checkbox"/> Binder migration _____ |
| <input type="checkbox"/> Discoloration _____ | <input type="checkbox"/> Trim _____ |
| <input type="checkbox"/> Water stains _____ | <input type="checkbox"/> Cut _____ |
| <input type="checkbox"/> Oleaginous stain _____ | <input type="checkbox"/> Tears _____ |
| <input type="checkbox"/> Silver sulfiding or tarnishing _____ | <input type="checkbox"/> Losses _____ |
| <input type="checkbox"/> Loss of highlight detail _____ | <input type="checkbox"/> Holes _____ |
| <input type="checkbox"/> Loss of dense detail _____ | <input type="checkbox"/> Adhesives _____ |
| <input type="checkbox"/> Loss of surface gloss _____ | <input type="checkbox"/> Cloth tapes _____ |
| <input type="checkbox"/> Emulsion flaking _____ | <input type="checkbox"/> Plastic tapes _____ |
| <input type="checkbox"/> Applied color flaking _____ | <input type="checkbox"/> Dirt/grime _____ |
| <input type="checkbox"/> Bleeding/feathering of applied color _____ | <input type="checkbox"/> Dust _____ |
| <input type="checkbox"/> Surface cracking/crazing _____ | <input type="checkbox"/> Smoke damage _____ |
| <input type="checkbox"/> Surface abrasion _____ | <input type="checkbox"/> Fingerprints _____ |
| <input type="checkbox"/> Embrittlement _____ | <input type="checkbox"/> Insect grazing _____ |
| <input type="checkbox"/> Media stuck to another object _____ | <input type="checkbox"/> Mouse chew _____ |
| <input type="checkbox"/> Emulsion softening _____ | <input type="checkbox"/> Insect or vermin accretions _____ |
| <input type="checkbox"/> Emulsion powdering _____ | <input type="checkbox"/> Mold _____ |
| <input type="checkbox"/> Cockling/buckling _____ | <input type="checkbox"/> Foxing _____ |
| <input type="checkbox"/> Channeling _____ | <input type="checkbox"/> Other (Describe) _____ |
| <input type="checkbox"/> Dimpling _____ | |

Additional Comments:

Appendix D: Museum Archives and Manuscript Collections

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APPENDIX D: MUSEUM ARCHIVES AND MANUSCRIPT COLLECTIONS

A. Overview

1. *What information will I find in this appendix?*
2. *What categories of archival materials are covered in this appendix?*
3. *Where can I find further guidance on NPS archival materials?*

This appendix gives guidance on how to manage archival materials that are accessioned into NPS museum collections. Archival materials advance the NPS mission of education, management, preservation, and research.

This appendix covers all categories of archival materials that may be accessioned into NPS museum collections, including:

- Records created by the park (such as associated records and other resource management records)
- Copies of records created by the park, if the park is required to transfer the originals to the National Archives
- Personal papers acquired through donation or purchase
- Organizational archives acquired through donation or purchase

Further guidance on archival materials appears in:

- NPS-28, *Cultural Resources Management Guideline*, Chapter 9.1
- ANCS+ *User Manual*, Appendix F
- DOI *Museum Property Handbook*, Vol. II
- NPS-77, *Natural Resource Management Guidelines*
- DO-19, *Records Management*
- NPS-19, *Records Disposition Schedule*
- NPS *Records Management Handbook*
- NPS *Conserve-O-Grams*

Guidance on NPS records falls under the authority of the NPS records manager and the National Archives and Records Administration (NARA). Park records include materials such as central files, financial records, and personnel records. Guidance on these records appears in NPS-19, *Records Management*, and in the NPS *Records Management Handbook*.

B. General Information On Archives

1. *What types of materials are considered archives and manuscripts?*

Archives and manuscripts include all types of documents, regardless of format. See Table 1 for examples. Documents may be in hardcopy (paper), or in any kind of magnetic, electronic, digital, or film technology.

2. *Are rare books or periodicals generally considered archival/manuscript materials?*

Individual documents may be loose, or they may be contained in file folders or in bound volumes. Carbon copies, photocopies, and other duplicates may be regarded as "original documents," depending on specific circumstances. For example, if an individual sent a letter to someone and kept a copy of that letter in his or her own files, then that copy would still be regarded as an original document in the individual's manuscript collection.

Examples of Archival Materials

- letters, reports, memorandums, minutes, notes, telegrams
- newspaper clippings
- maps, charts, architectural/engineering drawings
- albums, ledgers, diaries
- photographic prints, photographic negatives, slides
- motion picture film
- microfilm, microfiche
- phonograph records, sound recordings on reel-to-reel or cassette tapes, digital sound recordings
- video recordings on VHS, Beta, or other formats
- punch cards, automated data on magnetic tape, and any type of material contained on floppy disks, compact disks, and DVDs

Note: Individual documents may be loose, or they may be contained in file folders or bound volumes.

Table 1. Archival Materials

No. Rare books and periodicals aren't considered archival/manuscript materials unless they are part of a larger archival or manuscript collection.

<i>If...</i>	<i>Then...</i>
published books and periodicals are sufficiently rare to warrant accessioning into museum collections (as opposed to being managed as part of library collections),	handle them as individual museum objects, not as archival materials.

However, there are exceptions to this rule. For example:

<i>If...</i>	<i>Then...</i>
a collection includes a letter that discusses a particular book, and a copy of the book was sent as an attachment to the letter,	consider the book as part of the letter, and as such it's archival.
an archival collection includes the research files of an individual or organization, and magazine	the magazines would be considered archival.

articles, or even entire magazines, were included as part of those files,	a person or organization actually published books, pamphlets, or other publications, and kept a record set of those publications,	the publications would be part of the archival collection.
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Note: Ledgers, diaries, albums, and other bound materials that resemble published books are not actually books. These are unique records created by individuals or organizations. Handle them as archives.

3. Is there a difference between “archival collections” and “manuscript collections”?

Yes. “Archival collections” generally are groups of documents created by organizations, such as government agencies, corporations, and non-profit groups. (“Archives” can also mean the building or room where archival collections are housed and the organization responsible for managing archival collections).

“Manuscripts” are single documents or collections of documents created by individuals or families. These collections are sometimes called “Personal Papers.”

“Manuscripts” may also refer to groups of individual documents that were

- created by different persons or organizations, *and*
- assembled later from multiple sources

To avoid confusion, this appendix will call such collections “Assembled Collections.”

Archival collections or manuscript collections created by a single person or organization are “organic collections,” because they grow naturally as the result of the record creator’s activities. They include the letters, reports, receipts, and other documents that a person or organization accumulates and files as they go about their business.

Manuscript collections that are assembled from multiple sources or created by different persons or organizations, however, are “artificial collections.” These collections did not accumulate naturally as a by-product of a person or organization’s activities, but were acquired and brought together artificially by a collector.

4. What’s an archival collection?

An archival collection is a group of documents:

- created or received by a single government agency, corporation, non-profit organization, or other body, in the course of doing business, *and*
- filed together as a unit

An archival collection should include all the historically significant documents that the organization:

- actually created, such as reports, letters, memorandums, charts, photographs, and sound recordings, *and*
- received, such as letters sent to the organization by outside individuals or organizations

An archival collection should remain intact. Don't parcel it out among multiple collections. Don't mix it with other collections.

Note: For guidance on how to determine the historical significance of a collection, see Section E, Appraisal.

5. *What's a manuscript collection?*

A manuscript collection is a group of documents:

- created or received by a single individual or family, *and*
- filed together as a unit

A manuscript collection should include all the historically significant documents that the individual or family:

- actually created, such as letters, diaries, photographs, and sound recordings *and*
- received, such as letters sent to the individual or the family by other individuals or by organizations

An manuscript collection should remain intact. Don't parcel it out among multiple collections. Don't mix it with other collections.

Manuscript collections are also called "Personal Papers."

6. *What's an "assembled" collection?*

An assembled collection is:

- a group of documents created by different individuals or organizations, *and*
- compiled later from multiple sources

An assembled collection is also called an "artificial" collection because the documents bear no organic relationship to each other. That is, they were not created by a single person or organization. They didn't accumulate naturally as a record of the activities of that organization or individual.

For example, a manuscript collector draws upon a variety of sources to assemble a group of letters from African-American soldiers during the Civil War and a group of photographs on a single site taken by different photographers. The collector then sells or donates these "assembled collections" to the park.

7. *What are "park records"?*

Park records are records created or received by park staff in the course of conducting official activities. They can include letters, reports, notes, and memorandums actually written by park staff, as well as letters or other documents that they received. NPS records should be handled in accordance

with NPS Directors Order 19 (see Section F).

Example: A park superintendent writes a letter to a contractor concerning an archeological monitoring project carried out at the park and keeps a copy of the letter in the park's files. The contractor responds by sending the superintendent a letter, which also goes into the park's files. Both the copy of the letter sent by the superintendent and the letter that the contractor sent to the superintendent are park records.

8. Are personal papers or organizational archives acquired by the park through donation or purchase considered park records?

No. Only documents created or received by the park in the course of official activities are park records.

Documents created or received by a private individual, family, corporation, or non-profit organization, retained as part of the files of that person, family, corporation, or non-profit organization, and later acquired by the park through donation or purchase are not park records. They are not a record of official activity but are simply museum property.

9. Are there legal factors that make park records distinct from personal papers or the archives of non-NPS organizations?

Yes. Park records are covered by the Federal Records Act and access to them is governed by the Freedom of Information Act. They generally cannot be copyrighted. The personal papers of individuals or families and the archives of corporations or non-profit organizations:

- are not covered by the Federal Records Act,
- are not subject to the Freedom of Information Act or other regulations governing access to Federal records, *and*
- may be protected by copyright—even if those collections are owned by the park.

C. Archival and Manuscript Collections Owned by NPS Museum Programs

1. Is the NPS required to keep archival and manuscript collections?

Yes. In accordance with law or NPS regulations, parks must keep certain types of archival materials created by the NPS. For example, NPS regulations require parks to maintain resource management records. Parks are required by statute to retain associated records (such as field notes and reports on projects carried out at the park in archeology, paleontology, biology, ethnology, and geology—regardless of whether they were carried out by NPS staff, contractors, or private researchers working under park-issued permits). Parks should also retain files on historic structures, cultural landscapes, and other mission-related activities.

2. Can a park acquire archival and manuscript collections for the museum collection?

Yes. Parks can acquire archival collections that fit their Scope of Collection Statements. Parks can acquire archival collections through donation, purchase, transfer, or exchange.

Archival and manuscript collections play the same vital role in a collection as three-dimensional museum objects. These collections can document, commemorate, and reflect the cultural, natural, and historical themes and events associated with a park. For example, the museum collection at Thomas Edison NHS includes Edison's personal papers and the records of

3. *What purposes can archival collections serve in a collection?*
4. *Should I manage archival/manuscript materials in the same way that I manage museum objects?*
5. *What are the principal differences between archival work and curatorial work?*

the Edison Company. These materials are as important a part of the collection as Edison's first phonograph and the desk where he did his work.

Archival collections can serve a variety of purposes. They can provide:

- baseline information essential for managing cultural and natural resources
- contextual information necessary for understanding archeological, biological, and paleontological museum objects
- research materials for use by NPS staff, as well as by non-NPS historians, archeologists, and other scholars
- information for park-based educational and interpretive activities, such as exhibits, curriculum development, publications, and websites

No. Don't manage archival/manuscript materials in the same way that you manage museum objects.

Although individual documents technically are counted as objects for reporting purposes, they are fundamentally different from objects. They are part of a larger archival collection. All of the documents within a given collection are interrelated. This affects the way documents are housed, arranged, and cataloged.

There are several principal differences between archival work and curatorial work.

Cataloging by collection versus cataloging by object or lot

- Archival cataloging is fundamentally different from object cataloging. Object cataloging involves creating individual catalog records for each object or for each comparatively small lot of objects. Archival cataloging, however, involves cataloging an entire collection under a single catalog record, no matter how many documents it contains. A single archival collection can contain an infinite number of documents, and the documents themselves can cover an infinite number of projects. Lot-cataloged objects, on the other hand, relate to a single project and have the same name and provenience.
- Regardless of how many documents it contains, you should regard an archival collection as a single object. Assign a single catalog number to the collection as a whole.

Object cataloging is a one-step process, involving completion of a catalog record in the Collections Management Module. Archival cataloging is a two-step process, involving completion of a catalog record for the collection as a whole, followed by Archives Module descriptions of the collection's various subordinate parts. (Note: Archives Module entries, in turn, can provide the basis for a full finding aid—which is a critically-important tool for using any collection. See Section S "Description" and Section T "Folder Title Lists and Finding Aids".)

- Object cataloging usually is done on an object-by-object basis, but archival cataloging should *never* be done on a document-by-document basis—unless a document is not part of a larger archival collection. For individual documents on loan or of high monetary value, the park may complete individual catalog records in the Collection Management Module or item-level entries in the Archives Module—but it should still manage such documents as part of the larger archival collections to which they belong. Those individual catalog records for documents contained in larger collections would be done for accountability purposes only; since those documents would already be covered under the collection-level catalog record, they should not be counted a second time in the park's Collections Management Report. When these individually cataloged documents are returned, change the status of that document's catalog record to "Incorporated into Larger Archival Collection."

Arrangement

- An archival collection needs to be arranged in its proper order before you attempt to catalog it. You must complete this essential preliminary work before you can create a catalog record for the collection. You can't take a single document off the shelf and catalog it and move on to the next document. You must approach the collection as a whole and process and arrange the entire collection. Then you will understand what is in it and how the documents fit together. This is true whether the collection contains thousands of documents or only a handful of documents.

Multiple Accessions

- A single archival collection may be composed of multiple accessions, while a museum object is always associated with only one accession. For example, one archival collection may be composed of ten accessions from a single original source. Even though there are ten accessions, catalog the collection with one catalog record and one catalog number. The reverse is true in object collections, however, because an accession containing ten objects can result in ten catalog records and ten catalog numbers.

Classification versus Organization

- You don't classify archival collections in the same way you classify museum objects. For example, you wouldn't classify an archival collection by time period and material of manufacture or by genus and species. Instead, you analyze how each collection is organized and identify its component parts, such as series and subseries. You then base your cataloging and description on the unique internal organization of the collection.

6. *Why are archives managed on a collection-by-collection basis, rather than a document-by-document basis?*

Archives are managed on a collection-by-collection basis as opposed to a document-by-document basis for two reasons:

First, a document that is part of a collection has context and meaning in a way that an individual document cannot. A collection of documents can:

- reflect the development over time of historical themes and events
- suggest cause and effect
- show entire sequences of activities and thoughts
- help to authenticate individual documents

A single document is at best a snapshot, with little clear connection to what came before or after.

Second, as a practical matter, it's often impossible and usually unnecessary to describe each individual document in a collection. Some collections include thousands of documents. Attempting to describe each in the same detail that you would describe a three-dimensional museum object would be time-consuming and largely unnecessary. You can find individual documents more expediently in a well-organized collection than you can find individually cataloged items.

<i>If...</i>	<i>Then...</i>
it's necessary to provide detailed descriptions of individual documents within an archival finding aid,	it must be done within the context of the collection as a whole--and to do this, you should use the ANCS+ Archives Module.

7. *What kinds of archival and manuscript collections are likely to be accessioned into NPS museum collections?*

Archival and manuscript collections that may be accessioned into NPS museum collections include:

- personal papers and records of corporations or other organizations that meet a park's Scope of Collections Statement. (The park may acquire these through donation, purchase, transfer, or exchange.)
- resource management records created or received by the park for the purpose of managing park cultural or natural resources
- copies of certain NPS-created records

Note: Associated records are an example of resource management records. Associated records include field notes, site forms, reports, correspondence, maps, and drawings prepared in connection with studies or projects in such areas as archeology, ethnology, paleontology, geology, biology, etc. They are considered associated records because they are associated with objects and specimens that are accessioned into museum collections and with park sites where studies and surveys were conducted. It's necessary for the park to retain these records in order to understand and manage the objects, specimens, and sites (see Section M, "Handling Resource Management Records").

Other types of resource management records include maintenance files on historic structures, files on cultural landscapes, and land use files. These records provide baseline data and other information necessary for managing resources.

Apart from resource management records, original NPS files need to be handled in accordance with NPS-19. Even if you manage such records as a collateral duty, don't accession these records into the museum collection.

D. Fundamental Principles Of Archival Work

Archivists and curators have similar skill sets and interests. However, there are important differences between the underlying theories of archival and curatorial work. The most basic difference is that:

- archival work focuses mainly on *collections* of documents
- curatorial work focuses mainly on *individual* museum objects, or on object lots associated with *individual projects*

This section outlines some of the most important archival theories and procedures. You'll need to understand these before attempting to manage archival and manuscript materials. For further information, you may want to check the sources listed in the bibliography, or attend one or more of the archives classes offered by the National Archives and Records Administration, institutions of higher learning, and professional organizations (such as the Society of American Archivists).

1. What's "provenance"?

"Provenance" is the basis for modern archival work. It's the principle that the records of one organization or individual remain together. They must never be mixed with the records of another organization or individual.

The collection of documents that an organization accumulates in the course of doing business is a coherent whole. The collection of documents that an individual accumulates in the course of living his or her life is also a coherent whole. It's evidence of what that organization or individual did or knew. A collection shouldn't be broken up into smaller collections, and it should not be integrated with other collections. When documents from one collection are intermingled with documents from another collection, the integrity of both collections is compromised. Their research value and historical reliability are diminished. Even when collections cover the exact same subjects, themes, events, or individuals, you must maintain absolute fire walls between them.

Another meaning of "provenance" relates to the chain of custody or ownership of a collection. For example, you can trace the provenance of a park collection by starting with its current owner, the National Park Service. Then go back through any intermediate owners, to the collection's origins as the records of a particular organization or individual.

There are different options for managing associated records. Technically, you should treat associated records as series within an overall collection of the park's resource management records. Because of their special importance, it's permissible to treat all of a park's associated records for a single discipline as a stand-alone collection.

Example: All of a park's records on archeological projects may be handled as either series within the park's resource management collection or as a collection unto itself. Similarly, all of a park's records on biological projects may be handled either as a series within the park's resource management collection or as a collection unto itself (see Section M, "Handling Resource Management Records").

2. What's "original order"?

When organizations and individuals create records, they usually file them according to some kind of logical structure. They might keep all their correspondence together, arranged alphabetically. They might keep all their financial statements together, arranged chronologically. They might keep all their project files together, arranged according to a numerical filing code.

"Original order" refers to the way in which an organization or individual chose to maintain their records from the outset. That is, "original order" is the way in which the records were originally organized and filed.

Good archival procedure requires that a collection of records be kept in its "original order." You should avoid rearranging archival collections.

A common misconception among non-archivists is that "original order" is the order in which they found the records. This isn't necessarily true. Some collections remain in their correct, original order from the time they were created until the time they were acquired by NPS. In other cases, documents in a collection can get all mixed up before they reach NPS. When this happens, don't simply leave the collection in the order in which you found it.

When a collection has gotten out of order, you must put the collection back into its "original order." You must do this before you can proceed with further processing or cataloging. Unfortunately, there is no universal template for organizing an archival or manuscript collection. All collections are going to be unique. Section H, "Arrangement," gives tips on how to discern and re-establish the "original order" of a collection that has gotten jumbled.

There may be rare occasions when the original order of a jumbled collection is indiscernible or unusable. In such cases, an archivist may put the collection into an intelligible order. This should only be attempted if the archivist can determine that the original order cannot be re-established. For further information, see Section H, "Arrangement," Item 14.

3. What's an archival "hierarchy"?

The internal structure of an archival collection is called a "hierarchy." Archival collections are organized hierarchically. That is, collections are broken down into subordinate parts. These parts may in turn be broken down into subordinate parts, and so forth. You start from the top of the hierarchy with the collection as a whole. You go through the levels of the hierarchy to individual documents at the bottom of the hierarchy.

For example, suppose that a collection is composed of four parts called "series":

- Series I: Correspondence
- Series II: Financial Records

- Series III: Project Files
- Series IV: Annual Reports

Each of those series, in turn, may be subdivided into individual file units. Series III, Project Files, would be composed of individual files for each project. Each individual project file, in turn, would be composed of individual letters, memorandums, forms, or other documents.

Thus, an archival hierarchy goes from the general to the specific. Starting at the top of the hierarchy, the collection as a whole is the most general. Then the hierarchy becomes more specific as it moves down to the individual series. It then becomes even more specific as it moves down to the individual file units within those series. Finally, it reaches the most specific when it moves down to the individual documents within those file units.

Documents aren't individual museum objects or disconnected pieces of data. They're small parts of a whole. Each document will have a definite and permanent location in a larger context. Each document is related to something larger. For example, a document may be part of a file unit, which is part of a series, which is part of a full collection. This is why it's inappropriate to handle or catalog individual documents separately.

4. *What are the standard levels of an archival hierarchy?*

The standard levels of an archival hierarchy go in descending order:

- Collection Level
- Series Level (plus subseries, sub-subseries, etc., as necessary)
- File Unit Level (**Note:** A file *unit* is not the same thing as a file *folder*. A file unit is a group of documents filed together under a particular topic or title. A file folder is simply a physical device for holding those documents. It is not unusual for a single file unit to contain so many documents that it would take multiple file folders to hold all of the documents contained in that one file unit.)
- Item Level (individual documents)

5. *Must each collection follow a standard hierarchy?*

No. Each collection will have its own unique hierarchy. There's no universal template.

Some collections can have extremely simple hierarchies. A collection may be composed of a small number of individual documents that aren't organized into files or series. In that case, the hierarchy would simply involve the Collection Level and the Item Level.

At the other end of the spectrum, another collection may have an extremely complex hierarchy. It would encompass multiple series, some of which might be organized into subseries. Some of those subseries might be organized into sub-subseries. Some subseries might be made up of files that are arranged alphabetically. Some might be made up of files that are arranged chronologically. Some may be made up of bound ledgers that are arranged numerically. Some may be made up of individual documents that are not part of file folders or bound volumes.

The key is to evaluate each collection individually, by answering the questions:

- What are the collection's components (the series, subseries)?
- How are files within the various components arranged (alphabetically, chronologically, numerically)?

Remember: A hierarchy can be as simple as a single group of files arranged alphabetically, or it can be as complex as a collection that is divided into 10 or more series, all of which are divided into subseries, some of which are further divided into sub-subseries.

6. *What's an easy way to remember archival hierarchy concepts?*

Think of a collection as a multi-volume publication. Each volume would be analogous to a series. Within each volume, each chapter would be analogous to a file unit. Within each chapter, individual pages would be analogous to individual documents.

In other words, the pages of a multi-volume publication are not stand-alone objects. They follow a specific order and are arranged into chapters and volumes. Similarly, individual documents in a collection are not stand-alone objects. They follow a specific order and are arranged into file units and series.

A hierarchy is a little like an outline—you have to have two or more elements to justify going to a subordinate level. It is pointless to have an outline with just one heading (Roman Numeral I, but no Roman Numeral II), or just one subheading under a heading (Subheading II.A, but no Subheading II.B). It's the same way with archival hierarchies. You have to have at least two series to warrant organizing a collection into series. If you don't, then you just have a collection arranged into file units, with no series structure. Similarly, you should only break a series into subseries if you can identify at least two subseries.

7. *Why is it important to maintain a collection's provenance and to arrange it according to its original order?*

A collection is evidence of the knowledge, statements, and activities of the organization or individual that created the collection. If provenance and original order are protected, the collection will reflect historical development. It will show what the organization or individual knew or thought over time and document decision-making. It will also provide the context and background that are critically important to understanding the significance of each document.

For example, researchers can compare a person's diary entries with his or her outgoing letters. They can compare an organization's internal memorandums with its press releases to see if they are consistent. They can compare incoming letters with outgoing letters to determine how a person or organization responded to questions or events. They can compare documentation filed at the beginning of a project with documentation filed at the end of a project. This helps to provide a full picture of what took place.

One can evaluate the authenticity of documents more readily when they are retained in context with related documents created or received by the same

organization or individual. You compromise provenance and original order by mixing documents from one collection together with another or by rearranging collections. This makes it more difficult to:

- discern an organization's or individual's actions or responses
- recreate the context for that organization's or individual's actions or decisions
- authenticate documents

8. *Why is it important to arrange a collection in a hierarchical order?*

Hierarchical organization makes archival cataloging easier and more practical. Once you establish a collection's hierarchy, it's usually sufficient to catalog or describe only the upper levels of the hierarchy. In the vast majority of cases you don't have to catalog hundreds or thousands of individual documents or file units. It's usually only necessary to:

- complete a catalog record for the collection as a whole
- write descriptions similar to catalog records for the various series and subseries that make up the collection
- prepare a folder-title list or container list for the collection, if desired

Hierarchical organization also provides for an additional and useful method of access. Word searches and searches by accession number or catalog number are the primary methods to retrieve documents from collections that were cataloged on a document-by-document basis—but this often means that a researcher needs to have a fairly clear idea of specifically what to request. Hierarchical arrangement facilitates broader and deeper research by focusing on document types, functions, and creators. You can still do word searches and searches by accession number in a hierarchically arranged collection, but hierarchical retrieval in many cases is a more rewarding method because it does not limit researchers to documents, file units, subject terms, or accessions that they already know to request.

A properly arranged archival collection can be almost self-indexing. If a series is arranged alphabetically, you can search for specific files just as easily in the records themselves as in a finding aid—without having had to take the time to enter the titles of each file into the Archives Module. On the other hand, if you need to create finding aids with titles of each file unit, the Archives Module will make it easy to do.

9. *Am I prohibited from describing archival collections at the file unit or item level?*

No. It is always an option left to your discretion—but it should only be done when necessary. In most cases, having logically-arranged and properly-described series and subseries will be sufficient to enable researchers to zero in on the 5 or 10 file units containing the documents they need. Additional description at the file unit or item level won't add enough value to make it worth the effort—especially since container lists can provide an extremely easy alternative to full file unit descriptions. But it is always *possible* to do descriptions at lower levels of the hierarchy.

In a few instances, such as situations where you are working with associated records, full file unit descriptions may be recommended (see Section M, "Handling Resource Management Records").

One example of the sort of material where file unit description should be considered would be records relating to archeological projects. All records on a specific archeological project can be handled as a file unit within the Archives Module, and you can enter information on subjects, activities, locations, findings, investigators, and any other data concerning the project into the file unit screen—along with accession numbers linking the project with any associated objects. The files on each project will thereby retain their individual identity within the hierarchy, and will be readily identifiable within the hierarchy—but it will still be possible to do word searches and searches by accession number.

10. *What are the principal functions associated with archival work?*

The principal functions of archival work are:

- appraisal, scheduling, and accessioning (determining the long-term value of archival materials; deciding whether or not to accession them)
- arrangement (putting each collection into its hierarchical original order)
- processing and preservation (foldering; boxing; labeling; removing clips, staples, and other foreign objects; separating textual from non-textual materials; placing damaged or unstable documents into protective sleeves)
- description (including cataloging and the preparation of finding aids)
- access and use (including reference, exhibits, publications, and education)

Note: Each of these functions will be discussed in detail in its own section of this appendix.

Note: Never attempt to do any of the phases listed above before learning about the person, family, or organization that created the collection, and the history or other subjects covered in the collection.

11. *Why is it necessary to carry out these archival functions in the correct sequence?*

You should perform the archival tasks in the sequence listed above for several reasons.

- Before accessioning a collection, you should appraise it to determine whether it possesses sufficient value to warrant retention.
- Trying to use a collection before the important work of arrangement and description has been completed is difficult. You wouldn't have a finding aid or an arrangement scheme that could help you find the documents you need.
- Attempting to use a collection prematurely could interfere with the work of arranging, processing, and describing it. This would be like moving furniture and inviting guests into a room that's still being painted and carpeted.

Note: On very rare occasions you may have to use a collection that's still being processed. However, you must have a strong justification for doing so.

12. Why is the arrangement of a collection necessary before cataloging?

There's at least one sequence of archival tasks that's mandatory. Archival collections **must** be arranged before they can be cataloged. Description always follows arrangement.

Never attempt to catalog an archival collection before it has been physically arranged.

Archival cataloging and description are based on each collection's unique hierarchical arrangement. Therefore, you cannot begin to catalog a collection until you have completed arranging it. You must also have a good general sense of what's in the collection as a whole before beginning to catalog. You need to know the:

- physical types of documents
- information contained in those documents
- functions served by those documents

The best way to acquire this knowledge is through arranging and processing the collection.

Arrangement is the necessary preliminary work before cataloging. It can take a considerable amount of time. You can spend many days or weeks organizing and processing a collection before you can write a single catalog record. However, don't attempt to catalog archival materials before that preliminary work is done.

See Sections H-M for a full discussion of arrangement.

13. How is cataloging an archival collection different from cataloging museum objects?

You can't catalog archival materials in the same way that you catalog museum objects. When cataloging museum objects, you catalog one object or one small lot of objects at a time. Even with scientific collections, where it is important to classify objects and to document the relationships between objects, the result is still going to be one catalog record per object or one catalog record per lot. With non-scientific collection, where there may be little or no direct relationship between objects, it is possible simply to catalog one object at a time with no reference at all to other objects.

An archival collection, however, should never be cataloged on a document-by-document basis, as object collections are cataloged on an object-by-object basis. Instead, you have to create a single catalog record for an entire collection of archival materials (which might involve many thousands of documents). Then, you must develop separate archival descriptions for all series, subseries, or sub-subseries in the collection. If necessary, you can also describe individual file units or even individual documents.

Further, the cataloging and description of archival materials is based partly on how they are filed or housed. Object cataloging is not affected by the physical placement of the objects being cataloged. Even objects that were

collected as part of the same project or are otherwise related may be shelved, boxed, or stored in different locations. Apart from noting the physical location of each object or lot, a catalog record for an object will not be based on the object's physical placement. Actual physical arrangement, however, is central to archival cataloging.

Never attempt to catalog archival materials by cataloging one document, putting it back in the file or back in the box, and moving on to catalog the next document.

Archival cataloging is based largely on the physical arrangement of a collection. It is necessary to organize a collection into its hierarchical component—both physically and intellectually—so that you can describe those various components. Once the collection has been physically arranged, you will be able to describe the collection as a whole, then each of the series that make up the collection, each of the subseries that make up the series, and so forth.

Even though it can be time-consuming to complete the physical arrangement of a collection, the actual task of producing an archival catalog record can be done relatively quickly. A single catalog record may cover thousands of individual documents. These are counted as individual objects in the Collection Management Report. The time spent on cataloging and description is far less when you follow archival methods. This is true even if you complete series and subseries descriptions or container lists in the Archives Module.

Individual project files in archeology, paleontology, geology, biology, etc., can still be co-located with their associated objects at partner repositories even if the collection as a whole is arranged hierarchically. Just do a file unit description in the Archives Module, and note in the location field that the file unit is housed at another repository. If you do not already have an on-going agreement with that repository, you should also complete an Outside Loan Agreement. Even though the file unit is separated physically from the remainder of the collection, it is still part of that collection intellectually because it retains the same provenance as the remainder of the collection.

In short, don't attempt to catalog an archival collection on a document-by-document or file-by-file basis. Put all the pieces together in a hierarchical arrangement before cataloging.

E. Appraisal

This section outlines the criteria, standards, and methods you should employ to determine whether a collection is:

- historically significant, and
- eligible to be accessioned

1. *Why is it necessary to appraise archival and manuscript materials before accessioning them?*

For legal, professional, and practical reasons, it's unwise to accession all archival material that may be available. Just because documents are old doesn't necessarily mean they are worth keeping. NPS curators and archivists must apply specific criteria and make serious decisions about acquiring archival collections.

Federal records that must be retained by statute or because they are covered by an existing records disposition schedule don't need to be appraised. They are automatically eligible for accessioning (see Section F, "Records Schedules").

Example: Records associated with archeological projects at parks are covered by NPS-19, and Federal regulations require that they be retained. Therefore, you do not need to appraise them before accessioning them.

The Federal Records Act requires that certain types of park records be transferred to the National Archives. It would be inappropriate to accession such materials into NPS museum collections, no matter how valuable they are. The records schedule in NPS-19 provides clear guidance on this.

See Section F, "Records Schedules," for additional information on the Federal Records Act and NPS-19.

By applying good appraisal techniques, you can prevent museum collections from being inundated by:

- documents with minimal historical value that shouldn't be accessioned
- certain park records that are required to be sent by law to the National Archives

Appraisals prevent valuable NPS resources from being diverted away from legitimate museum holdings and activities.

Once archival collections are accessioned, it becomes very difficult to deaccession them. The items will be counted in the backlog and eventually will have to be processed and cataloged. The best deaccession policy is always a good accession policy.

2. *What are the two methods for determining whether a given collection of archival or manuscript materials should be accessioned?*

The two methods for determining whether you should accession archival materials are:

- Apply an *existing* "records schedule" to see if directions are already in place for handling this particular type of records. (**Note:** NPS staff apply existing records schedules to park records *only*. Records schedules don't apply to donated material.) See Section F for information on records schedules.
- Conduct an original appraisal of the materials in question. Evaluate the records according to several well-established criteria.

3. *How do I appraise donated materials?*
- You can't apply existing NPS records schedules to donated materials. Appraise each collection of personal papers or organizational records offered to your park. Follow the appraisal guidelines cited below in this section. Parks can appraise these kinds of materials completely on their own authority. You don't need to get authorization from the National Archives. See Section F for specific schedules covering NPS records.
4. *What are the guidelines for appraising archival and manuscript materials?*
- To qualify as a museum accession, a collection of archival or manuscript materials must:
- fit the park's Scope of Collections Statement, *and*
 - demonstrate enduring value in one or more of the following areas:
 - evidential value
 - informational value
 - legal value
 - intrinsic value
 - associational value
- Note:** The Scope of Collections Statement (SOCS) defines the museum objects and archival/manuscript materials a park will collect. Each park is required to have one. The SOCS reflects the park's mission. It focuses on museum objects and archival/manuscript materials that:
- relate to the park's cultural resources and natural history
 - relate to the site, subject, person, event, or other entity the park was established to preserve and interpret
- For further information on SOCS, see the *Museum Handbook*, Part I, Chapter 2.
5. *What's "evidential value"?*
- "Evidential value" documents the activities, goals, policies, programs, administration, and organization of the records creator. Such records constitute evidence of the actions taken or considered by the records creator
- A collection of personal papers that reflects the activities and thoughts of the person who created it has evidential value.
6. *What's "informational value"?*
- An archival collection has "informational value" if it contains information on historical events, themes, issues, and eras apart from the organization or the person that created the records.
- The archives of the Olmsted Firm at the Frederick Law Olmsted NHS are an example. They document the company's activities (evidential value), but also contain informational value about the:
- evolution of landscape architecture and urban planning in the late 19th and early 20th centuries

- cities where the Olmsted Firm designed parks and thoroughfares

The records of the Calumet and Hecla Mining Company and the Quincy Mining Company at Keweenaw NHS document the activities of those corporations. The records also contain informational value by documenting the:

- history of the mining industry and labor relations in Northern Michigan from the 1880s through the 1930s
- political and social history of mining towns in that area

7. How do I evaluate a collection's informational value?

Most collections will have at least some trace of informational value. However, not all collections with informational value should be accessioned.

To warrant retention on the basis of informational value, a collection must contain information that is unique, concentrated, and important.

Unique Information

Information contained in a collection is unique if:

- it's not readily available elsewhere (such as, in books, or in newspapers, or in other archival collections), *or*
- the collection contains information from a particular perspective that is not available elsewhere

Concentrated Information

Information in a collection is concentrated if it presents:

- many facts on a small number of persons, things, issues, or events; *or*
- a few facts on a large number of persons, things, issues, or events; *or*
- many facts on a large number of persons, things, issues, or events

Note: Collections that contain only a few facts about a small number of persons, things, issues, or events may not be sufficiently concentrated to justify accessioning.

Importance of the Information

The collection should have importance as a potential information source. The information should be primarily important for the NPS and secondarily for outside historians, scientists, and other researchers. Don't accession collections that are of no use as a reference tool or source of information for the NPS or outside researchers or would be readily available at public libraries or other repositories.

8. What's "legal value"?

Documents such as deeds, wills, articles of incorporation, and contracts may

have ongoing “legal value.” Such documents may be necessary to establish ownership, authority, responsibility, or obligation in a legal sense. Documents with legal value may be important not only for historical research, but also for present-day and future activities, from title searches to litigation.

Note: For park records, most records with legal value are already scheduled in NPS-19 (Appendix B) for permanent retention. They are retained either in the museum collection or at the National Archives.

9. What’s “intrinsic value”?

Some documents have value not for the information they contain, but rather as artifacts. Documents that are important as artifacts have “intrinsic value.” An excellent non-NPS example would be the Declaration of Independence. Innumerable copies of the Declaration of Independence exist all over the world. The original Declaration of Independence is on permanent exhibit at the National Archives. It contains no evidence about the operations of the Continental Congress or information about the American Revolution that isn’t readily available elsewhere. However, the document itself, as a physical object, has tremendous artifactual or intrinsic value.

Intrinsic value is seldom a factor when appraising an entire collection. However, it’s an important consideration in determining how to handle individual documents. Some documents are physically unstable and may cause surrounding items to deteriorate. These include newspaper clippings or telegrams on pulp paper, nitrate-based photographic negatives, and motion pictures. If an item is exceptionally deteriorated, it’s permissible to replace the original with a surrogate archival quality copy. If the original lacks intrinsic value, you may discard it without having to formally deaccession it. If it has intrinsic value, you should keep it for as long as possible.

10. What’s “associational value”?

“Associational value” refers to a collection’s relationship to a person, organization, or event whose history the park preserves or interprets. For example, Golden Gate NRA preserves and interprets the history of the former U.S. Penitentiary on Alcatraz. Accordingly, that park has collected archival materials associated with Alcatraz.

Associational value alone is usually not sufficient to warrant accessioning. It’s basically the same thing as meeting the park’s Scope of Collections Statement. Collections must not only fit the Scope of Collections Statement or have associational value; they must also possess evidential, informational, or legal value.

“Associated records” are also documents generated through the collection or analyses of artifacts or specimens. They are necessary for the management and future research use of those artifacts and specimens. Examples include field notes and reports produced as part of permitted research projects at the park. These records are associated with archeological, paleontological, geological, or biological objects or specimens in the park’s museum collection. Check both the Scope of Collections Statement and NPS-19 (Appendix B) for information on associated records that should be accessioned.

11. Are there other types of archival “values”?

There are other types of archival “values”:

- “Monetary value” refers to the dollar value placed on rare or

collectable documents. It should seldom, if ever, be regarded as a criterion for accessioning. In other words, if a collection has sufficient informational or evidential value and fits the park's Scope of Collection, but has little or no monetary value, it should still be accessioned. If, however, a collection has monetary value but does not fit the Scope of Collection or has insufficient informational or evidential value, then it probably should not be accessioned.

- “Administrative value” refers to the usefulness of a collection of park records for purposes of park management. Resource management records, as defined in NPS-19 (Appendix B), may be scheduled for permanent retention in park museum collections because of their administrative value.

Note: For further guidance on the methods and objectives of records appraisal, see “Strategic Directions: Appraisal Policy” (NARA Directive 1441), at <http://www.archives.gov/records-mgmt/initiatives/appraisal.html>.

12. How should a records appraisal be conducted and documented?

Records appraisals should be conducted and documented as follows:

<i>If...</i>	<i>Then...</i>
you are simply applying an existing records schedule to a collection of park records,	you should indicate the specific schedule and item number in the accession file.
you are developing a specific records schedule,	you should draft an appraisal report (in the form of a memorandum) and complete National Archives SF 115, Request for Disposition Authority.
you are considering whether to purchase or accept the donation of an archival or manuscript collection,	you should draft an appraisal report (in the form of a memorandum) stating how the collection meets the Scope of Collections Statement and has sufficient evidential, informational, or legal value to be accessioned.

Note: The appraisal report should explain how the records have sufficient evidential, informational, legal, or administrative value to be accessioned. Follow the chain-of-command and procedures at your park to get the appraisal report and SF 115 approved. Then submit them to the National Archives for a final decision.

13. What is the collections advisory committee, and what role does it play in appraisal?

Each park is required to have a collections advisory committee to review proposed deaccessions and make recommendations to the superintendent. The committee may also review proposed accessions, although this is not mandatory. Although this is left to the park's discretion, it might be a good idea to have the collections advisory committee review any appraisal reports prior to accessioning. The superintendent, of course, makes the final decision on both accessions and deaccessions.

14. When is it appropriate to conduct an archival survey?

You should initiate an archival survey of possible storage areas to locate any records eligible for accessioning if:

- your park doesn't have an active records management program in place to identify park records that should be transferred to the custody of the museum program, *and*
- it's likely that resource management records are stored at various locations throughout the park (offices, workshops, basements, garages, attics)

Records surveys and records appraisals are best conducted by a qualified archivist or records manager. If one is not available at the park, you may want to hire a contractor or seek assistance from your regional office.

15. What kind of information do I need to gather about any records I find?

Gather enough information to make a decision whether or not to accession any records that you locate. See **Figure D.1**. The survey should include:

- information on the physical location where the records were found
- name of the park office or park employee who created the records
- overview of materials, including the type of documents (ledgers, correspondence, invoices, press releases, photographs, reports), volume, date range, and topics
- NPS-19 file code, if applicable

16. Should I prepare folder title lists, full collection level or series level descriptions, or catalog records?

No. In-depth descriptive work usually can wait until after the records have been accessioned. There's no need to prepare folder title lists or other detailed description for records that aren't eligible or appropriate for accessioning.

Simply follow the instructions under "Disposition,"

17. If I identify records in my survey that fall under an NPS-19 file code, how should I handle them?

If...

Then...

NPS-19 calls for records under a given file code to be accessioned into the museum collection after a certain date,

accession them at the specified time.

the disposition instructions specify that the records are "temporary" or "non-permanent," or if they indicate that records should be transferred to the National Archives and Records Administration.

don't accession them into the museum collection.

18. *What if I find NPS records that are not covered by a file code under NPS-19?*
19. *What if I locate non-NPS archival materials during my survey?*
- Consult with the servicewide Records Manager. The Records Manager will advise you whether and how to submit a “Request for Disposition Authority” to the National Archives.
- Ideally, any non-NPS archival materials acquired through donation, purchase, or other means would already have been appraised and accessioned. If your survey uncovers any non-NPS materials that haven’t been appraised and accessioned, you should:
- ensure that your park has legal title (one way to do this is to check the accession file to see if there is a Deed of Gift).
 - appraise the materials according to the guidelines specified above to determine if they have sufficient evidential, informational, legal, administrative, or intrinsic value to warrant accessioning

F. Records Schedules

1. *What’s a records schedule?*

A records schedule is a set of directions for handling certain types of records that are likely to be created on an ongoing basis. In effect, a records schedule pre-appraises certain types of records. A records schedule will set forth directions for handling all records that fit into a specific category. The directions are based on a general assessment of how valuable any records in that category would be.

A typical records schedule will list one or more types or categories of records. The records schedule provides descriptions of the sorts of documents that would be included in those categories. See Table 2 for some examples.

Examples of Records Categories

[Please note: This list is not an all-inclusive; these are only examples]

Narrative Reports and Related Correspondence
Public Relations Files
Records of Conferences and Meetings
Special Events Files
Concessions Reports
Construction Programs Files
Maintenance Program Records
Roads and Trails Files
Contract Files
Budget Formulation Files
Land Use Files
Environmental Impact Records
Official Personnel Folders
Applications for Employment
Law Enforcement Reports
Fire Management Reports

For each record category, the records schedule provides instructions on the

disposition of those records. Examples of “disposition authorities” (or instructions) include:

- destroy when no longer needed
- hold for a specified time period, such as 5 years or 20 years, and then destroy
- hold for a specified time period and then transfer to the National Archives
- retain permanently at the park

Only records scheduled to be kept permanently at the park should be accessioned into NPS museum collections.

2. *What records schedules are available for use by NPS staff?*

NPS staff use the following records schedules:

- NPS-19 (Appendix B)
- General Records Schedules
- specific records schedules developed for individual categories of records at individual parks

3. *What's NPS-19 (Appendix B)?*

NPS-19 (Appendix B) is the Records Disposition Schedule for the National Park Service. It lists hundreds of categories of records in 12 general groups:

- Administration
- Concessions
- Development and Maintenance
- Fiscal
- History and Archeology
- Interpretation and Information
- Lands and Recreation
- Natural and Social Sciences
- Personnel
- Supplies, Procurement, and Property
- Laws and Legal Matters
- Fire Management

NPS-19 (Appendix B) is available on-line at:
<http://data2.itc.nps.gov/wapc/records/Index.html>.

It's also available via InsideNPS. Go to NPS Policies, click Records Management in the Select Policy Subject drop-down menu, and choose Records Management Intranet Web Site.

4. *How should I apply NPS-19 (Appendix B) to park records?*

Apply NPS-19 (Appendix B) to park records only (see definition, question 8 below).

<i>If...</i>	<i>Then...</i>
the records have been filed according to the filing codes provided in NPS-19,	you should compare the actual records to the appropriate code to confirm that they were properly filed.
the records were filed under the correct filing code,	follow the directions cited under "Disposition" for that particular code. Those directions will tell you whether you should:
	<ul style="list-style-type: none">• destroy the records after a certain period• transfer them to the National Archives• accession them into the museum collection
the records in question were not filed according to the NPS-19 filing codes, or if they were filed incorrectly,	review the filing codes to find the one that matches those records. Then follow the directions cited under "Disposition" for that particular code. Those directions will tell you whether you should:
	<ul style="list-style-type: none">• destroy the records after a certain period• transfer them to the National Archives• accession them into the museum collection
you are unfamiliar with the NPS-19 records codes and how to apply them,	consult with the park's administrative officer, the regional curator, or the NPS records manager.

Note: Certain file units—such as project files—may contain copies of documents with different filing codes. In such cases, leave the files intact.

5. *What's the General Records Schedule?*

The General Records Schedule is a collection of records schedules. It covers more than 20 broad categories of records that are commonly produced by Federal agencies. The National Archives and Records Administration (NARA) issues the schedule. It's available on-line at <http://www.archives.gov/records-mgmt>.

Apply the General Records Schedule to park records in the same manner that you would apply NPS-19 (Appendix B).

Most General Records Schedules relevant to the National Park Service have already been incorporated into NPS-19 (Appendix B).

6. *What are "specific" records schedules?*

You may discover park records that don't appear to be covered by either NPS-19 (Appendix B) or the General Records Schedule. Consult with your park's administrative officer to see if a specific schedule for those records exists. If there is a specific schedule, follow the disposition instructions. If there isn't a specific schedule covering those records, you'll need to get one.

7. *How can my park get a specific records schedule?*

To get a specific records schedule:

- Appraise the records in question, following the guidelines in Section E.
- Submit a “Request for Disposition Authority” to the National Archives and Records Administration. Provide the findings of your appraisal and propose a disposition (such as, destruction, transfer to the National Archives, or permanent retention at the park).

Note: The National Archives has legal authority over the disposition of all Federal records covered by the Federal Records Act. The Federal Records Act includes all NPS records. If you need assistance preparing a Request for Disposition Authority:

- check the National Archives website (<http://www.archives.gov/records-mgmt>.), or
- consult with the NPS records manager

8. *Should NPS-19 (Appendix B), the General Records Schedule, or specific records schedules be applied to any kind of archival or manuscript materials?*

No. Records schedules can only be applied to records produced by the National Park Service.

NPS records include all materials such as reports, letters, memorandums, photographs, sound recordings, films, floppy disks, CDs, maps, blueprints, videotapes, and any other kind of document filed in the course of official business. NPS records also include materials from outside sources that a park receives in the course of doing business. Some examples are letters written to park officials and contract proposals sent to the procurement office.

9. Should NPS-19 (Appendix B), the General Records Schedule, or specific records schedules be applied to donated or purchased materials?

No. Donated or purchased materials, such as personal papers and the records of non-federal organizations are not Federal records. Federal records schedules don't apply to them.

G. Accessioning Archival Materials

1. When should I accession a collection of archival or manuscript materials?

As detailed in Section E, you should accession archival or manuscript materials only after determining that the materials in question:

- meet the Scope of Collections Statement, and
- have sufficient historical value to justify permanent retention

Use one of the following methods to determine whether you should accession collections:

- For park records: Follow guidelines contained in NPS-19 (Appendix B).
- For park-generated documents that aren't considered official records: Appraise the materials to determine if they have evidential value, informational value, legal value, or administrative value. Include findings in a written appraisal report.
- For donated or purchased materials: Appraise the materials to determine if they have evidential value, informational value, or legal value. Include findings in a written appraisal report. **Note:** Only a qualified archivist or records manager should attempt to do an appraisal report.

2. What steps should I take to accession an archival collection?

Take the following steps to accession an archival collection:

Follow the accessioning procedures outlined in Museum Handbook II, Chapter 2, Accessioning. The same basic procedures and rules for accessioning museum objects also apply to accessioning archival collections.

- For donated materials: Have the owner sign a Deed of Gift (Form 10-830). Always ask for all copyrights when conveying title to the NPS, and get signed release forms.
- For purchases: Have an appropriate purchase document and statement of ownership. Always ask for all copyrights when purchasing collections for the NPS, and get signed release forms. **NPS policy states that donations or purchases of archival materials should be made without restrictions** (although exceptions may be made in certain cases).

- For materials from another park or Federal agency: Complete a Transfer of Property Form (DI-104).
- For records associated with field collections (such as field notebooks of archeologists, paleontologists, geologists, and biologists conducting research under NPS permit): Complete a Receipt for Property Form (DI-105).
- For materials acquired via loans: Complete an Incoming Loan Agreement and Receipt for Property (DI-105).

Note: It's permissible to accept copies of field notes and similar materials produced by outside researchers. See *Museum Handbook III*, Chapter 2 for information on copyright issues for field notes.

3. Does each document have to have an accession number?
4. Does each collection have to have a single and unique accession number?

No. Archival materials generally are accessioned in bulk. However, under certain circumstances it's possible for accession numbers to be assigned to individual items within a collection.

This is *preferred*, but isn't mandatory. There may be occasions where a single accession can contain materials from multiple collections. There may be occasions when a single collection may be acquired in multiple accessions. It's simpler and more efficient to handle archival materials when a single accession represents a single collection in its entirety, if at all possible. In defining an archival collection, however, the overriding factor is provenance—not the accession.

You should never intentionally combine multiple collections in a single accession – but sometimes this can happen by mistake. Example 3, below, provides guidance on what to do if you should encounter an accession combining two or more collections.

Example 1: The personal papers of a particular individual are donated to the park by that person's descendants, and receive an accession number. Then the family discovers an additional cache of that person's papers, and donates them, too. Because the park didn't receive these papers until many years after the initial accession, the new donation receives its own accession number. But the two accessions should be combined under a single catalog record because they are two parts of a whole: the personal papers of the individual who created them.

Example 2: All Resource Management Records for the park are being handled as a single collection (see Section M for more information on how and why this should be done). This collection contains several "recurring series," which are on-going series of records that will grow over time with the addition of new file units. New file units for these various series, such as "Grazing Records" or "Fire Management Records," should be given new accession numbers as they are received, but they should simply be added to the existing collection. Therefore, this collection of Resource Management Records may receive an infinite number of accessions over the years, but it will remain a single collection.

Example 3: The park receives a donation of archival materials as a single

accession. Upon further examination, it appears that the accession contains the personal papers of two different individuals. The accession therefore contains two distinct collections and should be split between two catalog records—one for each collection.

5. *Can accessions be divided?*

Yes. It's conceivable that multiple collections can get mixed together in a single accession. For example, a park may acquire two or more collections from a single donor and handle the donation as a single accession. When that happens, it's necessary to separate the different collections and then catalog and shelve each of them separately. If an accession contains three different collections, enter them into the ANCS+ Collections Management Module as three different catalog records. The same accession number should be cited in all three catalog records.

The most important unit in archives and manuscripts is the collection, not the accession or the individual document.

6. *Can multiple accessions form a single archival collection?*

Yes. It's not uncommon for a collection to be acquired by a park in two or more accessions. Sometimes collections can be acquired through many small accessions over a period of many years. This is particularly true for ongoing or recurring series, such as Resource Management Records, which will be produced as long as the park continues to exist. Although *cataloged* Resource Management Records will always have an end date, that end date will always be subject to change as you accession more recent records. (See next question, "What's an 'accretion,'?" for more information on adding new accessions to existing collections.)

When a single collection is broken out among multiple accessions, the collection needs to be reassembled. It's necessary to combine all of the accessions and handle the collection as a single item. Enter the collection into the ANCS+ Collections Management Module as a single catalog record. All of the accession numbers for that collection, however, should be cited in that catalog record.

7. *What's an "accretion"?*

"Accretion" is another name for an accession that is added to an existing collection that has already been cataloged.

It's not unusual to receive additional materials belonging to a collection after the collection has been arranged, shelved, and cataloged. For example, a donor could transfer all the papers of a famous ancestor to the park. Years later, he or she discovers another portion of that collection. In such cases, the donor might transfer the remainder of the papers to the park long after the original accession had been cataloged.

In another example, most parks accession field notes and other associated records relating to permitted research. The associated records for archeology or geology might each constitute a collection. They might also each constitute a series within a larger collection of Resource Management records. Unless parks discontinue permitted research, associated records will continue to be accessioned. In most cases, treat these records as accretions to the existing series or collections. Don't treat each new accession as a new collection.

8. *How should I handle accretions to a collection?*

Interfile accretions with existing materials or add them to the collections as a new series, depending on the arrangement of the collection. See Sections H, I, and J for additional information on how to arrange collections.

Update the existing catalog record by:

- adding an additional accession number for the accretion
 - updating the volume of the accretion to the volume of the collection as a whole
 - updating the date range for the collection if the accretion covers years beyond those covered in the existing collection
 - revising the description field if the accretion covers subjects not noted previously and types of documents not previously listed
 - revising the organization/arrangement field to show an additional series if the accretion is being handled as a new series within the collection (Remember to complete a new series screen in the Archives Module.)
-

H. Arrangement

Once you have accessioned a collection, the next step is to arrange it in its proper order. There's no universal template that can be used when arranging a collection. However, there are clear and fairly simple rules and standards that you must follow.

1. *What's arrangement?*

Arrangement is perhaps the most important step in managing an archival or manuscript collection. Arrangement is the process by which a collection of any size is brought under both intellectual and physical control. The way in which a collection is organized becomes the basis for all subsequent activities or uses in connection with that collection. Effective cataloging and access is possible only if a collection has been arranged. An unarranged collection cannot be cataloged properly or used efficiently.

Never attempt to catalog a collection until it has been arranged.

2. *Why is it necessary to arrange a collection before cataloging or using it?*

The "collection," not the individual document or file, is the basic unit of control in archives. A collection, regardless of size, represents a single grouping of items that's documented on a single catalog record.

Although an entire collection should be cataloged in a single catalog record in the Collection Management Module, you cannot stop there. For most archival collections, proper documentation requires description of the lower levels of the collection's hierarchy—such as the individual series and subseries—in the Archives Module. These descriptions are based on the actual arrangement of the collection. The catalog record, therefore, documents only part of a collection. For full documentation of a collection, you need to enter descriptions in the Archives Module.

Remember that a collection contains *ALL* historically significant documents in the park's custody that were created or received by a particular

organization or individual. If the park has 100 folders of documents created or received by an organization (such as a corporation, a non-profit foundation, or a government agency), then treat all 100 folders as part of a single collection. Do not handle each folder as an individual collection.

To make sense of a collection, it must be arranged. All but the smallest collections typically are subdivided into series. The series may be further subdivided into subseries and sub-subseries, which typically are subdivided into file units. Each document has a permanent location in this structure of series, subseries, and file units. The structure is similar to a book in which each page has a permanent location within a chapter. Otherwise, a collection would be nothing but a chaotic jumble of disconnected documents. There would be no logical order, no context, and no way of locating information except to search each document, one at a time. It would be like a book that is bound without regard for pagination.

Put another way, an unarranged collection is like a disassembled puzzle. To make the collection manageable and useful, you have to put the pieces together. Only then will the full picture become apparent. Trying to catalog a collection before arranging it would be like trying to describe the picture before assembling the puzzle. Trying to do reference in an unarranged collection is equally inefficient. It's like trying to find a particular scene in a thousand-piece puzzle by sorting through the loose pieces.

Fortunately, most collections will be in at least rough order when they are accessioned. Some collections may have been mixed up between the time they were created and the time they were accessioned. However, there are many clues and guidelines to help you put a collection back into its original order.

3. *What are the two key steps that I have to take in order to arrange a collection?*

The two key steps to arranging a collection are:

- *Define the Collection.* Clearly identify what materials are in the collection. In most cases, a single collection would include all documents created or received by a particular person or organization. Make sure the collection remains intact and is not mixed with any other collections.
- *Establish the Internal Organization of the Collection.* Determine if the collection is ordered correctly, or if you need to put it back into its correct order.

4. *How do I handle items that pertain to more than one collection?*

A collection consists of all documents created *or received* by a particular person or organization. Although some documents may pertain to other collections, all documents must be kept as part of that person's or organization's collection.

For example, you have a collection of George Washington's papers and a collection of Thomas Jefferson's papers. The Thomas Jefferson papers include an original letter that George Washington sent to Thomas Jefferson. Even though Washington wrote the letter, he sent it to Jefferson, who kept it in his own collection. Therefore, the letter becomes part of Jefferson's records, not Washington's. If Washington kept a copy of the letter for his own collection, however, that copy would properly be part of the Washington Collection.

5. *May I combine similar or related collections?*

No. Never mix one collection with another collection, no matter how closely related they might appear to be. Two collections of records that cover exactly the same topics created by two different organizations are two separate collections.

6. *May I break collections up into multiple collections if they are very large or cover different topics?*

No. You should never break up a collection. You may subdivide the collection into series and subseries and thereby address questions of size and subject. Those are internal or organizational divisions. The collection as a whole should remain intact and should be handled as a single catalog record.

One exception to the rule against breaking up collections into smaller collections involves associated records. You may treat all project files for a particular discipline as a collection, rather than as a series within a larger collection of park resource management records. Do not, however, treat individual project files as separate collections.

7. *Should I combine archival materials created by an individual while he or she was working for an organization into a collection with materials created by that same individual in his or her spare time?*

No. It's best to keep an individual's personal papers separate from documents he or she created while working for an organization or agency. For example, your park has the archives of an organization that includes the speeches and business correspondence of the organization's president. In addition, your park has that individual's personal correspondence and diaries. You should keep the documents created by that person in his or her official capacity as president of the organization with the organization's archives, and you should manage that person's private papers as a separate collection.

8. *Should each accession be regarded as a collection?*

Not necessarily. It's possible that:

- a park could acquire an entire collection as a single accession
- a park could acquire an entire collection through multiple accessions, sometimes spread out over several years
- a single accession may contain more than one collection, or portions of more than one collection
- the park may acquire a portion of a collection in an accession that is received *after* that collection has been cataloged (In such cases, add the new accession to the rest of the collection and revise the catalog record accordingly.)

Note: See Section G for a more detailed explanation of how to accession archival collections.

9. *What's meant by "archival arrangement"?*

Any collection of archives or manuscripts is going to be arranged in some manner. The arrangement patterns of larger collections may be fairly complex, but the overall concept of archival arrangement is a simple one.

As individuals or organizations create and save records, they seldom do so in a random manner. They usually don't keep loose documents in boxes or drawers without some kind of logical arrangement or filing system. Instead, they place documents into folders. Then they may group the folders based on subject, function, source, or document type.

For example, staff members in an office start working on a particular project. They are likely to open a file on that project. All of the letters, reports, notes, meeting minutes, and reference documents concerning the project would go into that file. The file, in turn, would be kept together with files on all of the office's other projects. These project files would be kept together in the same file drawer. There would be some kind of logical scheme for arranging them. They might be arranged alphabetically by the official title of the project or numerically according to an established filing code.

The office might also keep "reading files" containing copies of all outgoing correspondence. One way of handling these documents would be to open a new reading file every month. Staff would place copies of outgoing letters into that file as they are completed. All the monthly files would be kept together in the same file drawer. Similarly, as invoices are received from vendors, all of the invoices would be filed together. They could be filed in alphabetical order, by the name of the vendor, or in chronological order, by the date received.

An archival arrangement usually is nothing more than the basic structure that a person or organization adopted when filing records.

You could walk into almost any NPS office and quickly see that certain types of files are kept in one drawer. Other types of files are kept in other drawers. Those varying groups of records in the different drawers are like series in an archival collection. Each series—the project files, the reading files, the invoices, etc.—consolidates a group of files by type or function, and arranges them in a consistent pattern (alphabetically, numerically, chronologically, etc.).

10. Should all archival or manuscript collections follow the same arrangement patterns?

No. Each archival or manuscript collection will have a unique structure. All archival collections, however, follow the same "bigger to smaller" format. The goal is to keep the order in which the collection was originally kept. But the actual components and filing schemes will vary from collection to collection.

Some collections may be nothing more than a group of individual documents or individual file units. More commonly, however, individual documents or file units are organized into series or subseries. The file units or individual documents in some series or subseries may be arranged chronologically, whereas file units or individual documents in other series or subseries may be arranged alphabetically. There is no standard template. It all depends upon the specific collection because each collection will have its own unique organizational structure. For examples of variations in hierarchical structures for one category (park resource management records), see **Figure D.4a-D.4g**.

Arrangement patterns will vary based on any number of factors, such as:

- the work a person or organization does
- the size and complexity of the organization that created a collection of records
- individual preference for types of filing schemes and formats (certain

organizations or individuals may produce certain physical types of records that they choose to file together.)

Example: Type of Work

The records of the Thomas Edison Corp. at Edison NHP, include laboratory notes. The notes reflect the fact that the corporation was engaged in original research. The records of American President Lines at San Francisco Maritime NHP include ships' logs. The logs reflect that company's activities as a shipping line. A person or organization's specific activities or functions help determine the kinds of records they create. The activities and functions also determine the internal structure or arrangement of their archival collections.

Example: Size and Complexity

A small company may have one central filing system. It would keep all of its correspondence files together, all of its project files together, and all of its purchasing files together. A very large organization may be broken down into several components. Each component would have its own filing scheme. The arrangement of that organization's archival collection might therefore be broken out by the various organizational units. It would then be further broken out by the specific types of records that those units maintained.

Example: Individual Preference

Some individuals or organizations may keep financial records in bound ledgers. Others may keep financial records on loose sheets in file folders. Some may choose to arrange a particular type of material alphabetically. Others may choose to arrange a similar type of material chronologically or according to an alpha-numeric code.

Example: Types of Records

An organization may choose to file physical types of records together, such as architectural drawings, engineering drawings, maps, photographs, sound recordings, or motion pictures.

One of the most critically important responsibilities of the archivist or curator is to examine each individual archival or manuscript collection very carefully. The archivist or curator must be able to:

- *discern a collection's specific and unique arrangement scheme*
- *figure out how a collection was originally filed by the person or organization that created it*

11. *How can I determine original order if the collection has gotten out of order over the years?*

Use common sense, ordinary logic, and a basic familiarity with archival principles to determine the original order. See Section D for the archival principles that you will need to understand.

There are two key points to keep in mind:

- First, many collections will still be in their proper, original order when they're accessioned. All you have to do is identify that order and then maintain it. What are the main groupings of records? How are the files arranged within those groupings? If a file from one obvious grouping has gotten misplaced in another grouping, put that file back where it belongs. Draw up a "hierarchy" based on the order that you have identified (see Sections C and I for an explanation of a hierarchy.) Base your processing and cataloging of the collection on the way in which the collection is ordered.
- Second, there are many clues and guidelines that can easily help you put a mixed-up collection back into its original order (see item H-13, below, for examples).

You have to put the collection back together before you can proceed with any other tasks related to that collection. It's almost impossible to process, catalog, or use a collection effectively if it's not properly arranged.

12. Is it okay to alter original order to suit current needs?

No. If you can establish a collection's original order, then you must keep it. Even if there may seem to be a better way of organizing the collection, you must maintain the original order. There are several reasons for this.

The "original order" reflects how the records were filed. It also reflects the historical events and the historical contexts that they document. The original order is evidence of what actually happened, just as much as the documents themselves. Keeping a collection in its original order can help researchers discern:

- causes and effects
- responses to events
- the mindset of individuals at the time those events occurred
- the flow and patterns of history

By reordering a collection into what might seem like a more useful arrangement, such as topics that seem important at the time, you're imposing a subjective order on the records. This could make it more difficult for others to use the records in the future.

13. Is it possible to arrange a collection that's no longer in its original order?

Yes. Even if a collection gets all mixed up before it's accessioned or processed, it's usually possible to put it back into its original order. For example, mix up 26 volumes of an encyclopedia (arranged alphabetically), a ten-year run of a weekly magazine (arranged chronologically), and a set of financial ledgers (arranged by volume number). No matter how mixed up they are, it's easy to see that the encyclopedias belong together. The magazines belong together, and the ledgers belong together. It's equally easy to see that the encyclopedias should be in alphabetical order. The magazines should be in chronological order, and the ledgers belong in numerical order. Putting a disarranged archival collection back together is similar.

To determine original order, look closely at:

- arrangement schemes
- physical formats
- subject matter and function
- time frame
- source
- titles on file folders and bound volumes

For example, suppose you have 26 big bound volumes scattered throughout a collection. The volumes all carry the same title. Each volume is marked with a letter from A to Z (with none of the letters being repeated). The volumes all contain the same kinds of documents and information. Bring all of those volumes together as a series or subseries, and arrange them alphabetically. See Section J for information on series and subseries.

Similarly, suppose that hundreds of file folders labeled “Outgoing Correspondence” are also scattered throughout that collection. Each file folder is marked with a month and a year between 1937 and 1952. No month or year is repeated. The content of these file folders matches. All of the folders contain carbon copies of outgoing letters. The folders may be badly scattered through the collection. They may be jumbled with file folders containing different titles and are no longer in chronological order. However, they all appear to be part of one series. You should consolidate them and arrange them chronologically.

Figure D.2a is an example of a collection whose individual file units have gotten out of series order. **Figure D.2b** shows the hierarchy for that same collection upon being reassembled into its original order.

14. What if the original order is hopelessly lost, and there is no way of re-establishing it?

You must do everything you can to understand and preserve a collection’s original order. If the original order cannot be discerned, or if the original order was purely random, then the archivist may impose an order to make the collection useable. This should not be attempted except in extreme situations. If you have to impose an order on a collection, you should observe the following guidelines:

- Retain the provenance—that is, make sure that you are working with a single collection. Do not mix the collection with materials produced by another records creator, and do not divide the collection into multiple collections.
- Exert every effort to discern the original order. Do not attempt to impose an order unless you are certain that the original order cannot be ascertained or cannot be used even if it were ascertained.
- If at all possible, retain series and subseries structures. Confine yourself to reordering file units or documents within the original series organization.

Note: The decision on whether to impose order on a collection whose original order cannot be established should be made by a qualified archivist or records manager.

*If a collection is out of order, it's not acceptable to leave it that way.
Don't box, shelve, or catalog it in that condition.*

I. Hierarchical Structure

1. What's a "hierarchy"?

The “hierarchy” is the internal structure of a collection. It shows how a collection is organized into its subordinate parts (series). It shows how series are organized into their subordinate parts (subseries). It shows how file units in series or subseries are arranged. It is like an outline of the collection or a table of contents. By surveying and arranging a collection, the collection’s archival “hierarchy” will be identified. See Section D for additional information on hierarchies.

2. Why is hierarchical structure the key to arranging a collection?

The key to arranging an archival collection is to build from the top down. Begin with bigger elements and move down to their smaller components.

In other words, an archival collection should be arranged *hierarchically*. The top level of the hierarchy is the largest part of the hierarchy. This is the collection as a whole, which is all-encompassing. The bottom of the hierarchy is made up of the smallest parts of the collection or the individual documents themselves. In between, in descending order, would be the series, subseries, and file units.

The vast majority of collections are broken up into *groups* of archival materials. These groups are called “series.” Each series, in turn, is broken down into components. In some cases, a series is broken down into smaller groups, called “subseries.” In other cases, series are broken down into individual file units. Following the same pattern, these subseries may be broken down into yet smaller groups called “sub-subseries.” They may also be broken down into individual file units. Each file unit, meanwhile, will contain one or more individual documents (or “items”).

Looked at from the bottom up, this means that each document will belong to a file unit. Each file unit will belong to a subseries. Each subseries will belong to a series, and each series will belong to a collection.

The internal structure of an archival collection is not unlike the internal structure of the *Museum Handbook*. For example:

- An archival collection may be divided into *series*. The *Museum Handbook* is divided into *volumes*.
- An archival series may be divided into *file units*. Each volume of the *Museum Handbook* is divided into *chapters* and *appendices*.
- An archival file unit is divided into individual documents, or “*items*.” The chapters and appendices in the *Museum Handbook* are divided into *sections*.

You can take the *Museum Handbook* out of its binders and shuffle the pages.

However, you can still put it back together in its original order. Similarly, if individual documents and file units in an archival collection get shuffled, it's still possible to put them back in their original order.

3. *What should a hierarchy look like?*

Figure D.3a shows a sample hierarchy for a collection of organizational archives. **Figure D.3b** shows a sample hierarchy for a collection of personal papers. Both hierarchies show how collections may be subdivided into series. They also show how some of those series, but not all of them, may be further subdivided into subseries and sub-subseries. The sample hierarchies show how subdividing into series, subseries, and sub-subseries may be based on:

- differences in the physical format of documents
- the type of documents
- the content or function of documents
- the origin of documents
- the filing or arrangement schemes

Most importantly, the sample hierarchies show how the different components in a collection relate to each other. Every element in a collection is part of a larger element. An item is part of a file unit, a file unit is part of a series, and so forth.

It's important to remember that these hierarchies are only examples, not templates. You should not simply try to force collections in your custody into these sample hierarchies. Each collection will have its own hierarchy, based on what the collection actually contains and how it's actually structured.

Identifying a hierarchy is not like classifying an object. You are not trying to place each document or each file within a taxonomic structure. Instead, you need to identify a collection's unique components. Identifying a hierarchy is nothing more than identifying a collection's internal structure. It all depends on how a collection is organized and how the documents are filed, which will be as different for each collection as the table of contents is different for every book.

4. *How should the various elements in the hierarchy (such as series, subseries, file units) be titled?*

Each element should have a unique title.

- No two collections among your holdings should have the same title. Never use generic titles when naming collections, such as "Associated Project Documentation." Indicate the creator of the records and the type of materials, such as: "Thomas E. Edison Papers" (the records creator is Thomas E. Edison, and the materials themselves are personal papers) or "Records Associated with Archeological Projects at Andersonville NHS" (the records creator is Andersonville NHS, and the materials themselves are archeological project files).
- Within a particular collection, no two series should have the same title.

If you have two very similar series, find some way to differentiate between them. For example, if you have a series of subject files covering the years 1920-1940 and a series of subject files covering the years 1941-1960, you can differentiate them in the titles as follows: "Subject Files, 1920-1940" and "Subject Files, 1941-1960." Do not just put "Subject Files" in the title fields for both series. (Of course, it is all right to have a series entitled "Subject Files" in one collection and a series entitled "Subject Files" in another collection. Because the two series are in different collections, there is no conflict).

- Within a particular series, no two subseries should have the same title.
- Within a particular series or subseries, no two file units should have the same title. (Very large files can be contained in multiple folders, all of which would have the same title, but they are still all part of the same file unit. Example: You have a series of "Accounts Receivable" files that are arranged chronologically. The file unit for "Accounts Receivable – March 1938" is so voluminous, however, that it needs to be broken out into three separate folders. But these three folders all are part of a single file unit, so it is okay to put "Accounts Receivable – March 1938" on each of them. In such cases, they should be numbered "1 of 3," "2 of 3," etc.)
- Within a particular file unit, each document should have a unique title. If you are doing item level description—which is strongly discouraged—do not just identify individual items with a generic title such as "Letter" or "Memorandum." Indicate what the document actually is, such as "Final Report of the Planning Committee, August 13, 1905" or "Letter, Smith to Jones, December 5, 1915."
- Through a hierarchical approach, every series, every subseries, every file unit, and even every item will have a unique and permanent intellectual address. This is essential for managing, retrieving, and citing documents. For example, there can be only one document with the following intellectual address: "Fred Smith Papers: Correspondence: Outgoing Letters: December 1915: Smith to Jones, December 5, 1915." This intellectual address clearly identifies the item ("Smith to Jones, December 5, 1915"), the file unit ("December 1915"), the subseries ("Outgoing Letters"), the series ("Correspondence") and the collection ("Fred Smith Papers").

Note: This unique hierarchical address method works, even if you only describe a collection down to the series or subseries level. If someone requests a copy of the letter from Smith to Jones, December 5, 1915, you do not need to have that individual letter described in the Archives Module in order to find it. If you have the series and subseries descriptions entered into the Archives Module, however, you will know where to find the letters that Mr. Smith sent out. You can just go to the box containing the outgoing letters for 1915. Thumb through the files until you come to the "December 1915" file, and flip through the letters until you come to the one you want. It is like looking up an article in an encyclopedia. You don't need to know the exact page where the article is printed. All you need to know is the alphabet and where the set of encyclopedias is located.

For further information on naming conventions and other standards for archival description, you may want to consult the Society of American Archivists' publication Describing Archives: A Content Standard (DACS) (2007), or its predecessor volume, Archives, Personal Papers, and Manuscripts (1989), by Steven L. Hansen.

5. How should a hierarchy be used?

Once you have established a hierarchy, you have a blueprint for all future work involving that collection.

Processing and Arrangement Phase

As you process and arrange a collection, the hierarchy serves as your guide for putting documents and files into their proper order. The physical storage of the collection will reflect the hierarchical structure. Box and shelf series and subseries in the same order as they appear in the hierarchy.

Cataloging Phase

As you catalog a collection, you base your descriptions on the different levels of the hierarchy. You write a brief overall description of the collection as a whole. You then write similarly brief descriptions of each series, subseries, sub-subseries, and so forth. Generally, you should avoid individual descriptions of file units and items. See Sections R and S for further discussion on how to catalog archival and manuscript collections.

Reference and Document Search

As you conduct reference and search for documents in a collection, the hierarchy serves as the roadmap. It's the basis for the development of finding aids.

J. Organization—Series And Subseries

1. What's a "series"?

A "series" is a "natural" grouping of records. It's natural in the sense that the person or organization that created the records devised the groupings. The creator grouped the records mainly for ease of retrieval.

2. How are series grouped?

Series are grouped based on one or more of the following elements:

- *Arrangement Scheme:* A series should reflect a single arrangement scheme throughout. All the files, volumes, or documents within a series should be arranged alphabetically, chronologically, numerically, or according to some other consistent pattern.
- *Physical Type of Document:* The creator of a particular collection of records may have filed all the photographs together, or all the architectural drawings, or all the maps together. If so, these groupings by physical type might each constitute a series--but only if that is the way in which they were originally filed. If the records creator filed photographs together with letters and reports in a single series, then those photographs must remain part of that series—even if you have to separate them physically for preservation purposes (see Sections P and Q for more information on the physical removal of oversized

documents and photographs from textual series; also see the “If-Then” table under item 8, below).

- *Subject Matter or Function:* The records creator may have filed all the personnel files together. All the project files or all the financial records may be filed together. Series breakdowns typically reflect this kind of division.
- *Time Frame:* Certain types of records may be broken down into series by time periods. For example, a collection of correspondence may be arranged alphabetically by the name of the correspondent and grouped into blocks of 10 or 15 years. It may make sense to leave those blocks of correspondence intact as separate series. Grouping the records by time period might be better than attempting to interfile them with alphabetized correspondence from a subsequent 10-year period.
- *Source:* It’s conceivable that a group of documents received from a particular source could constitute a series. For example, a collection of financial records may consist of account statements, financial reports, correspondence, and cancelled checks received from different banks. These materials could be organized into one series per bank

Note: People and organizations that create collections of records usually file their documents in a logical format. They keep certain types of documents together in a consistent filing scheme. For example, a filing cabinet may have one file drawer containing Project Files. A second file drawer could contain Correspondence Files, and a third file drawer might contain Invoice Files. Each of those components would be a series. Identifying the various series in an archival or manuscript collection should be as simple as identifying the drawers in the filing cabinet.

3. What's a "subseries"?

A “subseries” is a series within a series. Sometimes it’s appropriate to break a series up into smaller groups called subseries.

4. When is it appropriate to have a subseries?

There are many reasons why it may be appropriate to break up a series into two or more subseries. Here are the most common reasons:

- different arrangement patterns
- different time periods
- different physical formats
- different sources or different types of records

Different Arrangement Patterns Example

Suppose all the correspondence files for a particular collection are kept together. This would constitute a single series. Within this series of correspondence files, however, the incoming letters are arranged alphabetically by name of correspondent. The copies of outgoing letters are arranged chronologically. You cannot have a series in which some of the file units are arranged alphabetically and some are arranged chronologically. Subdivide this series into two subseries. One subseries is for the alphabetically-arranged incoming letters. The other subseries is for the

chronologically-arranged copies of outgoing letters.

Different Time Periods Example

Suppose the records-creator filed incoming and outgoing letters together, arranged alphabetically. Then suppose that the person or organization that created the records stopped adding to this body of correspondence after 10 years. The individual placed it in storage and then started a new batch of alphabetically arranged correspondence that would run for the next 10 years. The archival collection would have two separate 10-year blocks of alphabetically arranged correspondence files. All of these correspondence files properly constitute a single series. However, it wouldn't be practical to try to integrate them into a single alphabetized group of files. Instead, break the series into two subseries--one for each 10-year block of records. To avoid confusion, be sure to include the beginning and ending dates of these subseries. Enter the dates in the date fields when you catalog the records. You should also incorporate the dates into the formal titles of the subseries: "Correspondence Files, 1960-1969" and "Correspondence Files, 1970-1979."

Different Physical Formats Example

It's not unusual for a group of photographs to constitute a series within a collection. But good records preservation practice calls for prints and negatives to be housed separately. Moreover, it's not unusual for prints and negatives to have different arrangement schemes. Prints are likely to be filed by subject and negatives by image number. In such cases, it's appropriate to subdivide a series of photographs into two subseries. Create a subseries of prints and a subseries of negatives.

Different Sources or Different Types of Records Example

An organization that creates a collection of archival materials may do so along administrative lines. It may file all of the correspondence together. It may file all of the personnel records together and all of the project files together. It would then subdivide them according to the division of the organization that created them. The Correspondence Files could be broken down into groupings such as the President's Office, the Research Division, and the Publications Division. In this case, the basic types of records--Correspondence Files, Personnel Files, and Project Files--would all be handled as series. Then each of them would be sub-divided into subseries for each of the organizational units. Alternatively, all of the records of each organizational unit could be filed together. There would be three series: President's Office Records, Research Division Records, and Publications Division Records. Those series, in turn, would be subdivided into subseries for each records type. For example, the series of Research Division Records would be broken down into subseries. There would be three subseries: Correspondence Files, Personnel Files, and Project Files.

5. What's a sub-subseries?

Just as a subseries is a series within a series, a sub-subseries is a series within a subseries. Not all collections in NPS custody will reach that level of complexity. However, it can happen, and it's just as easy to identify a sub-subseries as it is to identify a subseries.

Suppose the records of an organization were divided by administrative unit.

The records of the Research Division would constitute a series. The series would be subdivided according to type of records. The series might include a subseries of photographs. That subseries of photographs would likely be subdivided into a sub-subseries of negatives and a sub-subseries of prints.

It's even possible to go down to the sub-sub-subseries level. Suppose the sub-subseries of prints in the preceding example were subdivided. One group of prints is arranged by subject. A second group of prints is arranged by the name of the photographer. Each of those subdivisions would constitute a sub-sub-subseries.

6. *Why is it necessary to keep dividing and subdividing archival collections?*
7. *When should I stop subdividing?*

You need to subdivide a collection until you have consistent bodies of records. A consistent body of records is the same kind of records arranged according to a single arrangement scheme.

When a series or subseries or a sub-subseries consists of chronologically arranged correspondence files, you can stop subdividing, or when you have a series or subseries of personnel files that are arranged alphabetically, you can stop subdividing. If you have a group containing any other mismatches of record types or arrangements, then you need to continue subdividing. For example, if you have a series of alphabetically-arranged project files and numerically arranged ledgers, you should divide it into two subseries.

In most cases, you will not have to subdivide beyond the series or subseries level. In some cases, you will not have to subdivide. All of the files in a collection may contain the same type of material and follow a single arrangement pattern. Subdivide collections into series and subseries (and additional lower levels) only as necessary. Subdivide only to group bodies of like records in a single arrangement scheme.

8. *Should all items in a particular physical format be consolidated into a single series or subseries?*

Not necessarily. Only consolidate items of a particular format into a single series or subseries if the records creator originally filed them that way.

<i>If...</i>	<i>Then...</i>
the records creator kept all photographs in a set of albums,	those albums would constitute a single series or subseries.
the person or organization that created the records filed photographs with other types of materials, such as attachments to letters, or as illustrations for reports,	they are a permanent part of those letters or reports and would not constitute a separate series. Even though they should be separated physically for preservation purposes (see Section Q), intellectually they remain part of the file in which they originally were kept.

Don't store records with different formats together because they can damage each other.

Photographs that are kept next to letters, for example, can damage the fibers and inks in the letters. The fibers and inks in the letters can also damage the

photographs. In such cases, you have two options. First, you may place the photographs into protective sleeves, and leave them in their original location. If this is impractical (because of the photographs' sizes, volume, or condition), then they should be physically removed and stored separately from the letters. Place a separation sheet where the photographs were initially located, indicating that the photos were moved (see **Figure D.5**). If possible, put a photocopy of the removed photograph with the separation sheet. Even though the photographs will be stored elsewhere, they technically remain part of the letters. They should still be considered part of the file units and series in which the records creator originally filed them. They don't constitute a separate series or subseries.

For further guidance on removing certain types of documents from their original locations for preservation purposes, see Sections N-Q.

9. *What's the difference between a "closed" series or collection and an "open" or "recurring" series or collection?*

A "closed" collection or series has been accessioned and cataloged. There is no expectation that additional materials will be accessioned later for addition to that collection or series. Closed collections and series tend to be those that were created many years ago by individuals or organizations that are no longer producing records. It's possible that supplementary accessions (or "accretions") can be added to closed collections or series. This typically occurs when some historical material is overlooked when the bulk of the collection was first transferred to NPS. When such material is discovered, it may be restored to the existing collection in the form of an accretion. Ordinarily, however, accretions of new material are not added to closed collections.

An "open" or "recurring" collection or series is one where additional accessions are expected routinely. The collections or series are still being created on an ongoing basis. You can keep adding new accessions to these series and collections even after they have been cataloged. All you have to do is add the new material (as a file unit within an existing series, or as a new series within an existing collection). Modify the collection level description in the catalog record to reflect the addition of the new material (for example, the volume and date range could change and the hierarchical structure could change if there is a new series). Contact the Park Museum Management Program in the Washington Office to adjust your Collections Management Report when you make your annual National Catalog submission. (The "new" cataloging will show up under previously Cataloged Part I and Total Cataloged Part III.)

The various categories of park records are the most prevalent type of open collections or series likely to be maintained by NPS museum programs. This is because the same kinds of park records are being produced on an ongoing basis by the parks.

Example: Associated Records are a textbook example of recurring series. A park is likely to accession new project files in archeology, paleontology, biology, or geology on an ongoing basis—perhaps annually, for some parks. Once you have established a collection or a series for project files in a particular discipline, you only have to add the new project files to that existing collection or series and then update the catalog record.

As noted in Sections E and F, only certain types of park records may be accessioned into museum collections. Park records should be disposed of in accordance with NPS-19 and the Federal Records Act. It's permissible for

museum programs to accession resource management records, as defined by NPS-19. Most other park records should either be destroyed or transferred to the National Archives and Records Administration.

10. How should I arrange an open or recurring series or collection?

There are two ways of handling additional accessions for an open or recurring collection or series:

- Newly accessioned file units can be added to the end of an existing series if minute interfiling is not required. For example, suppose an existing series consists of reports that are arranged chronologically from 1940 to 1960. The accretion contains the same kind of reports arranged chronologically from 1961 to 1970. The accretion can be added seamlessly to the previously accessioned materials as part of the same series. Adjust the collection level catalog record and the collection and series level archives records to reflect the additional material.
- Newly accessioned file units that can't be added easily to an existing series may be added to the existing collection as a new series. For example, suppose the accretion contains the same kinds of material, but the material is arranged differently. Create a new series record in the ANCS+ Archives Module. Adjust the collection level catalog record and collection level archives record to reflect the existence of a new series.

Note: Accretions to open or recurring collections or series shouldn't be handled as new collections. They shouldn't receive separate catalog records. For example, your resource management records include a series of plant surveys covering the years 1985-1989. You accession additional plant surveys covering the years 1991-1995. Those new plant surveys should be added to the existing series. They shouldn't be catalogued as a new collection.

K. Organization, File Units And Items

1. What's a "file unit"?

A “file unit” is the basic means by which individual documents are physically consolidated and arranged. File units are the building blocks of the series (or subseries). A series that doesn’t need to be subdivided into subseries (or a subseries that doesn’t need to be divided into sub-subseries) is typically a body of records that is made up of one or more file units, arranged in a consistent pattern.

When records creators start accumulating records, they usually do so by setting up file units. The file units hold documents relating to particular projects, or topics, or individuals, or functions. The file unit, therefore, is the component of the series (or sub-series) that contains all of the documents relating to a project, individual, or function, that were filed together.

2. Is a file unit the same thing as a file folder?

No. It's important to understand that the file *unit* is not the same thing as a file *folder*. A file unit is a grouping of related documents. A file folder, however, is merely a physical device for holding those documents. There is no limit to the size of a file unit. If a project is especially complicated or protracted, the project file may grow. It may encompass hundreds of pages, held in dozens of file folders. The project file constitutes just one file *unit*,

no matter how many file *folders* it requires.

3. How are file units arranged?

File units are arranged in several ways.

If...	Then...
the title on a file unit contains names or words,	the files probably will be arranged alphabetically.
the title of a file unit is a number,	the files probably will be arranged numerically (or by filing code).
the title on a file unit is a year or date,	the files probably will be arranged chronologically.

4. Should I subdivide file units?

No. File units should remain intact, even if they contain a mix of documents. For example, suppose a records creator routinely places all of his or her records each month into a single file unit. These may include reports, invoices, correspondence, newspaper clippings, and transcripts of speeches. You would not subdivide this group of material. Each file unit would contain the same sort of thing (that is, everything). The file units could be placed into a consistent arrangement pattern (arranged chronologically by month).

Leaving a file unit intact, however, is not the same thing as leaving everything in one folder. If a single file unit contains many pages, it may be necessary to use several folders to contain all the pages, but doing so does not mean you are creating new file units. Instead, you are just using more than one folder to contain a single file unit. Also, a file unit may contain oversized maps that should be removed and flattened, but doing so does not mean you are creating a new file unit for those maps. The maps are still part of the file unit intellectually, even if they have been separated from the rest of the file unit physically.

Remember: a file unit is not the same thing as a file folder. A file unit would contain all of the documents filed together by the records creator on a particular topic, or project, or individual, regardless of how many documents there might be. The file unit might cover many folders, depending on how many documents it contains.

Note: If a folder is so full that it is bulging, you may divide it into enough folders so that everything fits comfortably. Dividing a file unit into multiple folders is like slicing a pizza. You can cut it into four pieces or six pieces or eight pieces, but it is still a single pizza. You cannot cut it into halves, however, and sell it to customers as two separate pizzas.

5. What are some types of file units that are not contained in folders?

Although the majority of documents are placed into file folders, there are other types of file units that don't use file folders, such as:

- *Volumes and Binders.* Some records creators place documents into loose-leaf binders or bind them into volumes. A file unit might constitute all of the documents:

- in the binder
- under one tab in the binder
- in multiple binders

In such cases, you have to look carefully at the titles on binders and tabs to make sure you are able to identify file units properly.

Note: If you are able to remove documents safely from binders or volumes, you should transfer them to regular file folders. See Section O, “Processing and Preservation—Paper-Based Documents,” for information on preservation.

- *Ledgers, Logbooks, and Diaries.* Whether identified by number, date, or name, individual financial ledgers, logbooks, or diaries tend to be regarded as individual file units.
- *Drawers and Divided Drawers.* Oversized maps and charts may be placed into map cases. In such cases, it’s possible that the records creator treated individual drawers as file units. Note the tabs or labels on the drawers and scrutinize the contents closely. This will help you to determine if file units were handled on a drawer-by-drawer basis. Similarly, a records creator may have placed photographs or index cards into rows within filing cabinet drawers. He or she separated the rows with dividers noting name, subject, or some other kind of file unit identifier. All of the photographs or index cards between two dividers might be regarded as file units.
- *Electronic File Folders.* Records creators may keep all of their documents electronically, grouped into electronic files. Retain the electronic arrangement of documents as the file units. In many cases, it may be advisable to print all the documents. Then place them into file units that replicate the electronic arrangement. See Sections N-Q for information on preservation and processing.

6. What's an "item"?

An “item” is a single document. Most collections are made up of series, and most series are made up of file units. File units are made up of items.

“Item” and “document” are not synonymous with “page” or “sheet.”

An item may only be a one-page note, or it may be a report extending to hundreds of pages. Whether one page or hundreds of pages, it would still be just one item. An item might also be a single magazine, or a photograph, or a reel of audio tape, or even a roll of film.

An item may include attachments. If a letter is received with other documents as enclosures, those enclosures should be regarded as part of the letter. The letter and the enclosures together would constitute a single item.

Remember, archival and manuscript collections should be organized hierarchically, from the general to the specific. The collection level is at the

top of the hierarchy because it's the most general (the collection as a whole). The item is at the bottom of the hierarchy because it's the most specific (individual documents). In between are the intermediate levels of series, subseries, sub-subseries, and file units. These become increasingly specific as you move down the hierarchy.

L. Step-By-Step Arrangement

1. *What's the first step in arranging a collection?*

Step 1: Review the collection in its entirety.

You may do this as part of a formal archival survey, or you may do this informally. In either case, you need to become generally familiar with all parts of the collection. You need to understand the full scope of the collection before you can start arranging the collection. You can't start arranging a multi-box collection simply by opening the first box, taking out a handful of documents, and putting them into some kind of order. You need to have a basic idea of what's in the collection as a whole. You'll then have a basic idea of how everything will fit together. Avoid moving or rearranging anything until you have completed this review. As you conduct our review, be sure to take notes that will help you carry out subsequent phases of the arrangement process.

2. *What sorts of things should I look for in a review?*

Review or survey the collection and conduct additional background research to determine the following:

- What types of records does the collection contain?
- What subjects, functions, and years are covered in the collection? (This shouldn't be an exhaustive and comprehensive list. All you need is a very basic sense of what's in the collection.)
- What is the history of the organization (or the biography of the person) who created the collection?
- Most importantly, can the collection be subdivided into multiple groupings (or series) of records? Does it appear that the person or organization that created the records filed all of the following together:
 - correspondence
 - financial records
 - project files
 - photographs

Note: Not all collections need to be subdivided into series. A collection that consists of one type of material arranged in a consistent fashion doesn't need a series organization. For example, a collection may consist entirely of letters received from various sources. If you can incorporate all of them into a single alphabetical, numerical, or chronological arrangement scheme, then series breakdowns are inappropriate.

3. *What's the second step in arranging a collection?*

Step 2: Identify each of the broad, basic groupings of records within the collection. These are the series.

The series provide the overall organizational structure for the collection. This is critically important because this is the structure you'll have to follow when arranging the collection.

4. *What's the third step in arranging a collection?*

Step 3: Carefully review *each* series you have identified to determine if it needs to be subdivided into subseries.

If so, then identify those subseries, just as you identified the series within the collection as a whole. If there are no series, then skip to Step 7. (Remember that the theory behind breaking series down into subseries is exactly the same as the theory behind breaking collections down into series.)

5. *What's the fourth step in arranging a collection?*

Step 4: If a particular series should be broken down into subseries, then review *each* subseries.

Determine if the subseries need to be divided into sub-subseries. If so, then identify those sub-subseries, just as you identified the series and subseries. If there are no sub-subseries, then proceed to Step 7.

6. *What's the fifth step in arranging a collection?*

Step 5: If a particular subseries should be broken down into sub-subseries, then review *each* sub-subseries.

Determine if the sub-subseries need to be divided into sub-sub-subseries.

7. *When do I stop subdividing a collection?*

Don't get carried away when identifying groupings of records such as series or subseries. Follow the pattern of subdividing until you have identified a body of records that consists only of:

- file units or items, *and*
- the file units or items don't need to be subdivided into groupings

For example, suppose you have properly identified a series of correspondence files. These correspondence files are arranged alphabetically by name of correspondent. Then suppose that there are multiple file units for several of the correspondents. There might be five letters from Mr. Smith, seven letters from Mrs. Bell, and eight letters from Mr. Jones. All of the letters are filed separately. Don't break these out as a subseries of letters for each person. Handle them all as individual file units within the series, arranged according to the series-wide alphabetical arrangement scheme. Be sure to include the date of the letter and the correspondent's name as part of the file unit title. Then arrange the file units for each individual correspondent chronologically. The series would be arranged alphabetically by name of correspondent. The alphabetized file units would be arranged by date.

Note: Such decisions often rely on judgment calls and common sense. A series of correspondence files that includes hundreds of letters from several sources might be appropriately broken out as subseries.

8. *What's the sixth step in arranging a collection?*

Step 6: Identify the arrangement scheme for the file units in the series (or subseries, or sub-subseries, and so forth).

Are these file units arranged chronologically, alphabetically, numerically, or according to some kind of filing code?

9. *What's the seventh step in arranging a collection?*

Step 7: Physically arrange the collection. Make sure all of the:

- items are in their proper file units.
- file units are arranged according to the applicable filing scheme
- series, subseries, sub-subseries, sub-sub-subseries are properly grouped

Remember that if a collection is divided into series, then everything in that collection should be contained in one of those series. The collection shouldn't be organized into 10 series plus a few stray documents or file units. If you've identified 10 series for that collection, then every item must be contained in one of those series. You'll have to create new series to accommodate stray documents that don't logically fit within an existing series.

If a series is broken down into subseries, then everything in that series must be contained in one of those subseries. The same principle applies for sub-subseries and for additional levels below that.

If a series or subseries is organized by file unit, then everything should be part of a file unit. If you have a series made up of 100 file units, you cannot also have an individual document included as part of that series. Either locate the file unit where it belongs or create a new file unit for that one document.

10. *How should I arrange an assembled collection?*

An assembled collection is a body of documents selected from multiple sources. The documents have no organic connection to each other. Any order they might have would reflect the activity of the collector, rather than reflecting the activities of the individuals or organizations that created the documents. Therefore, there is no "original order" to an assembled collection and no true hierarchy.

Because an assembled collection is completely artificial, you are free to arrange it in whatever manner seems most efficient. A few suggestions:

Assembled Collection of the Same Kind of Documents

Catalog a collection level record. In the ANCS+ Archives Module, ignore the series, subseries, and file unit levels, and go straight to the item level. Arrange the individual items chronologically, or alphabetically, or any other way that seems to work.

Assembled Collection of Different Types of Documents

Catalog a collection level record. In the ANCS+ Archives Module, create series for each of the different formats, such as letters, diaries, and maps.

Assembled Collection of Small Groups of Documents from Different Sources

Organize the assembled collection into series according to the sources. The U.S.S. Arizona Memorial, for example, includes groups of 5-20 documents that various individuals donated. Most of the documents were collected rather than created by those individuals. The individual groups of documents don't really rise to the level of a true collection. Organizing them each as series within an assembled collection is a way of managing them efficiently, while retaining their provenance.

Assembled Collection Compiled and Arranged by a Private Collector, and Later Donated or Sold to the Park

Catalog as a single collection, retain in the order established by the collector, and provide series, filie unit, or item level entries—as appropriate—in the Archives Module.

M. Handling Resource Management Records

1. What are resource management records?

Resource management records are park files. They include baseline and other types of information that the park needs to manage its cultural and natural resources effectively. Depending on the park, resource management records might include files on:

- land use
- wildlife management
- construction and maintenance
- research projects in archeology, paleontology, biology, and geology

2. What are the two acceptable methods for handling resource management records?

One method is to handle all resource management records for a park as a single collection, covered by a single catalog record and a single catalog number. This collection, of course, will expand as new resource management records are created and accessioned. This means that the catalog record will have to be modified as the collection grows.

The second method is to handle associated records separately from other resource management records. Under this method, all associated records for a specific discipline would constitute an individual collection, with one catalog record and one catalog number. Thus, all records associated with archeological projects would constitute a collection, all records associated with paleontological projects would constitute a collection, and so forth. These collections of discipline-specific project files would also expand over time, necessitating updates to the catalog records.

3. What commonly used method of handling resource management records should I avoid?

Many park museum programs have treated files associated with specific projects, studies, or maintenance jobs as individual projects. As a result, parks have many tiny “collections” that in reality are nothing more than file units. This method of handling resource management records is ineffective and fails to meet archival standards.

Handling project files as separate collections is not consistent with standard

archival practice. Archival management is based on provenance (the records creator), not on individual projects. All Resource Management project files are records made or received by the park—regardless of whether they were authored by park staff, regional/center staff, contractors, or outside researchers. Therefore, all resource management records are official records of the park, and that is the basis for defining the collection. Individual project files, rather than constituting individual collections, would be part of a larger series or collection of resource management records.

Example 1: Five different archeological projects took place at a park. One project was initiated by the park and carried out by the park archeologist in order to locate foundations of a historic house that can be highlighted in interpretive programs. Another project was initiated by the regional archeological center and carried out by staff members at the center in order to comply with Section 106 requirements. The third project was carried out by a contractor hired by the park to monitor the impact of new construction on one of the park's archeological resources. Another two projects were carried out under park permits by local university professors working on separate research projects. Associated records for each five projects were accessioned separately, but they should not be cataloged separately. Even though the five projects were conducted by different archeologists, for different organizations, and for different purposes, **they are all park records relating to one type of activity—archeology**. Instead of each accession being cataloged separately, they should all be cataloged as:

- part of a single series of archeological project files within the park's collection of resource management records, *or*
- as a single collection of the park's records associated with archeological projects.

Example 2: A park-owned historic structure is painted in 1960 and again in 1968, 1975, 1982, 1990, and 1995. It is legitimate to keep the documents as resource management records. But these slender files on individual paint jobs down through the years should not be handled and cataloged as separate collections. Instead, they should be handled as simple file units, within a subseries relating to the painting of historic structures, within an overall series relating to construction and maintenance, within a collection of general resource management records.

4. *How is it possible to find individual files if all resource management records or all records associated with the projects in a specific discipline are covered in only one catalog record?*

It is easy to locate files *if you use archival methods instead of curatorial methods*. This means:

- organizing files according to standard, hierarchical archival principles
- entering collection-level information into the catalog record and entering series and subseries descriptions (as appropriate) into the Archives Module, taking special care to explain how the files are arranged in each series or subseries. If more information is needed in order to locate individual files, you may either do file-unit level descriptions or container lists in the Archives Module.

It is never enough simply to provide a general description in the catalog record. Proper archival management requires that series descriptions and other information be entered in the Archives Module.

5. *How should I arrange a collection containing all of a park's resource management records, including the associated records?*

They should be organized into series according to discipline or function, such as:

- Land Records
- Wildlife Management Records
- Construction and Maintenance Records
- Archeology Records
- Paleontology Records
- Biology Records

The file codes in the NPS-19 (Appendix B) may help to identify appropriate ongoing resource management series. The various series, in turn, may be broken down into subseries and sub-subseries. These subdivisions depend on the nature of the records and the way in which they have been filed. Within each series or subseries, be careful to note how the files are arranged—alphabetically? chronologically? numerically?

6. *How should I arrange associated records at the park that are handled as separate collections?*

All files for a particular discipline for a particular park should be handled as a single collection (even if some of the files are held at the park, some at a regional center, or some in non-Federal repositories) because they are all park records, regardless of where they are housed.

A collection of associated records may be organized into series, depending on a variety of factors. **There is no universal template that you can follow when organizing any collection. The way in which the collection is organized depends on the type of material, the nature of the projects, how the documents are filed, and other considerations.**

See the “If-Then” Box for suggestions on how a collection of associated records might be organized. See **Figure D.4** for several examples of how to organize collections of associated records into archival hierarchies

<i>If...</i>	<i>Then...</i>
you have to determine whether or not to accession Resource Management Records,	consult the NPS-19, Appendix B, to identify which types of Resource Management Records are appropriate for accessioning into the park museum collection, which types should be transferred to the National Archives, and which types should be destroyed.
you have accessioned Resource Management Records into your park museum collection,	handle them as a single collection, with one catalog number, and organize them into series and subseries approximating the various categories in the NPS-19, Appendix B. Carefully describe each series and subseries in the Archives Module, and prepare container lists as desired.
you receive <i>additional</i> accessions of Resource Management Records <i>after</i> you have already cataloged a body of Resource Management Records under one catalog record,	add the new accessions under the existing catalog record. If the new accessions fit under existing series, then simply modify the series descriptions to reflect the new material, and amend the container lists. Otherwise, add new series as necessary. Then update the catalog record to reflect the additional volume, the new date range (if applicable), and the added series (if applicable). Copy the revised catalog record over to the Archives Module. Contact PMMP to adjust your CMR when you make your NCS submissions. (The “new” cataloging will show up under previously Cataloged Part I and total Cataloged Part III.)
there are Associated Records included among your Resource Management Records,	you may handle all the files for a particular discipline (archeology, paleontology, biology, or geology) as a series within the overall collection of Resource Management Records, or you may handle all the files for a particular discipline as a collection unto itself (e.g., Records Associated with Archeological Projects, Records Associated with Biological Projects, etc.)
Associated Records in a particular discipline were originally filed	retain that basic structure by organizing the collection into

<p>according to document type (for example, all the reports, correspondence, and other textual materials together; all the photographs together; all the maps together),</p> <p>maps, photos, and textual material for a collection or a series of Associated Records originally were all filed together in the same folders,</p> <p>Associated Records for a particular discipline include files relating to projects initiated by the park, by a center, or by private researchers working under permits,</p> <p>your park is the lead park for multi-park projects in biology, and therefore receives accessions both for park-specific biological projects and multi-park biological projects,</p> <p>Associated Records for a particular discipline include files for park projects, center projects, and private (permitted) projects, and were originally filed by record type (textual materials, maps, photos, etc.)</p>	<p>series by type; if the Associated Records for that discipline are being handled as a series within an overall collection of Resource Management Records, then organize the series into subseries by type.</p> <p>do not organize the collection into series by type (or the series into subseries by type). Instead, retain the simple file unit arrangement, but remove photos and maps for separate housing. Even though the photos and maps are housed separately, they would not constitute separate series or subseries because technically they will remain part of the file units from which they were removed.</p> <p>either maintain a single arrangement scheme for all the files, according to the accession number, or organize the collection into series (or subseries) according to who initiated the project: one series for records of projects initiated by the park; one series for records of projects initiated by a center; and one series for records of projects initiated by private researchers.</p> <p>organize your collection of Associated Records Related to Biological Projects into two series: one for park-specific projects, and one for multi-park projects.</p> <p>first, organize the collection into series according to who initiated the project (one series for the park, one series for the center, and one series for private researchers). Second, organize the series into subseries by record type.</p>
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7. If all project files for a discipline are brought together into a single collection, isn't that like mixing collections or creating an artificial collection?

No. Most associated records are simply the records of individual projects. Individual project files are not collections.

Archival management is based on the concept of "provenance," which refers to the person or organization that maintained a set of files. Project files in archeology, paleontology, geology, and biology may be authored by different people and organizations (NPS staff, contractors, outside researchers, consulting firms, universities). However, the actual copies that

were submitted to and retained by the park are park records. That is, they are records created or received by the park in the course of conducting official activities. One records creator (the park) plus one type of material (project files in a specific discipline) equals one collection. Therefore, individual project files simply are part of that single collection.

The concept of “non-mixing,” however, still prevails. Just as you should not mix collections, you should not mix project files or file units within collections. The file for each project needs to remain intact and distinct from files for other projects, even as they are contained within a single collection or series.

8. *How should I catalog a collection of associated records?*

Enter collection-level information into the catalog record in the Collections Management Module. Then, copy that information over to the collection-level screen in the Archives Module. Then, enter series-level and subseries-level data into the Archives Module, as appropriate. Within the series or subseries, the associated records should fall into natural groupings of one or more folders that relate to a single research project (and any objects or specimens associated with that project). Each folder or group of folders relating to one project would represent one file unit (or project file). You may arrange these file units within their series or subseries in any scheme that works for your park. One option is to use accession numbers as the organizing principle. The accession number would also serve as the file unit number, and you would be able to arrange the project files by accession number. Provide a file-unit level description for each project, under the appropriate series. Include all the information you will need to locate it—such as name of project, name of project director, subject, dates, location of project. If a project file has multiple folders, you may list the titles of each folder in the container list (which can be found in the Supplemental Information attached to the collection-level screen in the Archives Module). See **Figure D.6** for an example of a finding aid based on this model.

Remember that the physical arrangement should mirror the intellectual arrangement. Project files should follow the same order in the Archives Module as they do on the shelves. Thus, if you identify individual project files by their accession numbers in the Archives Module, then they should be boxed and shelved in the same order. The primary exception to this rule is for project files that must be co-located at another repository so that they can remain with their associated objects (See Items 9 and 11 below).

9. *What if project files are held at different locations—with some at the park, some at a regional archeological center, and some at a partner repository?*

Because all the project files would be records of the park, they should all be described under a single catalog number as part of a single collection **regardless of their storage locations**. If the records relating to a specific project must be loaned or transferred off-site, all you have to do is complete the necessary Outgoing Loan documentation and indicate in the location field of the file unit screen where the file unit is housed. Provenance—not storage location—is what defines a collection.

10. How should I arrange and catalog new project files that are accessioned after I have finished cataloging a collection of associated records?

Since the files should be in accession order (or some other equally easy-to-administer arrangement), simply add new accessions to the end of the collection. Then, add a new file unit record in the Archives Module describing the new accession. List folder titles as necessary in the container list. Modify the catalog record to reflect changes in the collection's volume and date range. Make sure these updates also appear in the collection level screen of the Archives Module. At National Catalog submission time, ask the Park Museum Management Program to adjust your Collections Management Report to reflect the new cataloging. New accessions can be added this way indefinitely and in a very short time.

11. Do these methods for arranging records satisfy the Code of Federal Regulations requirement for keeping archeological objects together with their associated records?

Yes. The regulation specifies that objects and their associated records be held in the same repository, so that the documentation can be retrieved easily to provide context and background for the objects.

The requirement is met by:

- accessioning both the associated records and the objects into the park's museum collection
- ensuring that the documentation shows the link between the objects and the associated records
- co-locating project files with their associated objects, as necessary

The regulations do not specify that any specific filing schemes be followed, so the park is not required to follow such non-standard archival methods as cataloging each accession as a separate collection. Proper archival methods will not interfere with regulatory requirements and should make it even easier to locate project files and associate them with objects—even if they are housed at off-site repositories. Describing a project file within a single collection of park records will not prevent the park from loaning or co-locating that project file.

12. Without a unique catalog number, how can associated records be cross-referenced to the objects?

The file unit description for each project will contain its accession number, which should be the same as the accession number for the objects. Even if the objects and associated records are accessioned under different numbers, those numbers can be cross-referenced in the Associated Accessions field in the file unit screen of the Archives Module.

Project files can be cross-referenced just as easily to catalog records for specific objects. For example, suppose a natural history specimen is collected for one project, cataloged separately, and subsequently used for research in connection with another project. The catalog number for that specimen should be noted in the Summary Note for that project's associated records.

13. How can I loan individual documents or files if they don't have unique collection numbers?

Associated records can be tracked with the unique archival collection number, series number, and file unit number in the ANCS+ Archives Module. A series, subseries, or file unit remains in the same place in a collection's archival hierarchy, even if the records are on loan. You can also create an individual catalog record in the Collection Management Module for a document or file unit that you send out on loan, and cite the catalog number in the Outgoing Loan Agreement. When the loaned document is returned, you return it to its proper place in the collection's

hierarchy, and change the status in the catalog record to “Incorporated into Larger Archival Collection.”

N. Processing And Preservation

1. When should I process an archival or manuscript collection?

It often makes sense to process a collection at the same time you’re arranging it. This may be the only time you will need to handle virtually every document in the collection individually. It’s efficient to use the opportunity to:

- refolder, rebox, and label the collection
- cull extraneous material
- take basic steps to protect damaged or fragile documents

Processing a collection in this way can serve as the first line of defense in preserving a collection.

2. What supplies and equipment will I need to process an archival or manuscript collection?

Examples of the supplies and equipment you may need to process a collection appear below. You probably won’t need all of these supplies for every project, so you don’t need to keep stockpiles of everything. It is probably advisable, though, to have supplies of boxes, folders, polyester sleeves, spacer boards, white gloves, and other most commonly used supplies readily available.

- acid-free document storage boxes (flip-top archives boxes) in letter-size and legal-size
- acid-free flat storage, newspaper storage, and drop-front storage boxes in various oversized dimensions, as appropriate
- acid-free records storage boxes (also called “records center cartons”) in one-cubic-foot size
- acid-free photographic print and negative boxes
- acid-free slide storage boxes and slide storage cases (for holding the boxes)
- acid-free file folders in letter-size, legal-size, and various oversized dimensions, as required
- buffered photographic print and negative envelopes and sleeves (for black and white images)
- unbuffered photographic print and negative envelopes and sleeves (for color images) **Note:** Recent research suggests that high quality buffered paper may be better for color images than unbuffered.
- unbuffered, four-flap enclosures (for glass plate negatives)
- polypropylene sheets and sleeves for photographic prints, negatives

- and slides
- archival-quality polyester sleeves (Mylar D) in legal-sized and letter-sized
 - acid-free spacer boards
 - white, acid-free, high tack neutral pH acrylic adhesive box labels
 - soft lead pencils
 - bond paper, interleaving sheets, and rolls of archival-quality interleaving and wrapping paper
 - soft, unbleached cotton tying tape
 - plastic or stainless steel paper clips
 - micro-spatulas
 - flat-blade staple removers (not standard office supply staple removers, which can damage documents)
 - pH testing pens
 - cotton gloves

In addition, refer to the *Museum Handbook*, Part I, the *Conserve O Gram* series, and the *Tools of the Trade*. They contain information on storage equipment, such as cabinets and shelving.

Depending on the archival materials already available to you, you may not need all of the supplies and equipment listed above. You may need additional items. For example, there are specialized boxes, sleeves, envelopes, and wrappings for microfilm, microfiche, compact disks, videotapes, motion picture film, and the diverse formats of sound recordings.

For additional materials you may need, consult the NPS *Tools of the Trade* or any of the various commercial archival supply catalogs.

3. *What are textual and non-textual materials?*

Textual materials are traditional, paper-based documents, such as letters, reports, notes, clippings, telegrams, and memorandums.

Non-textual materials are records in a variety of specialized formats. These include:

- cartographic records (maps)
- architectural/engineering drawings
- photographs (prints and negatives)
- motion picture film

- videotapes
- audio recordings (reel-to-reel tapes, tape cassettes, compact disks, wax disks, wax cylinders, and wire recordings)
- microforms, including roll film, sheet fiche, and aperture cards
- computer punch cards
- electronic records in all storage media (floppy disks, compact disks, magnetic tape, and even hard drives)

4. *Should I process textual and non-textual records differently?*

Yes. Process textual and non-textual records differently because specialized records require specialized handling. Records in different formats shouldn't be kept together in the same folders or the same boxes because they can damage each other.

5. *What should be done if a collection contains documents that are folded?*

Unfold them. Fold lines can cause damage to both standard-sized and oversized materials. See Section P for information on oversized materials.

For example, it's not unusual for letters to be filed as they were received folded into thirds. Unfold them and file them flat.

6. *How should I handle paper records that are acidic?*

<i>If...</i>	<i>Then...</i>
an acidic document has intrinsic value,	place it in a protective sleeve in order to keep it from damaging other documents. Also place a sheet of alkaline buffered paper in the sleeve, to keep the document from damaging itself with its own acidity.
acidic documents (such as telegrams and newspaper clippings) don't have intrinsic value,	replace them with copies made on acid-free paper and destroy the originals.
If you are in doubt about an acidic document's intrinsic value,	Don't throw it out; retain the document, but isolate it to prevent damage to other materials.

7. *How should I handle paper records that are fragile?*

<i>If...</i>	<i>Then...</i>
records are fragile but stable (such as letters typed on onionskin paper),	place them in Protective sleeves.

records are fragile and unstable (such as “Thermofax” copies, which become illegible over time and become so brittle that they can break into pieces), copy them onto acid-free paper, and destroy the originals.

8. *How should I handle paper records that are damaged?*

<i>If...</i>	<i>Then...</i>
documents are moderately damaged (slight tears, holes),	place them in protective sleeves (avoid attempting to repair them yourself with adhesives).
documents are severely damaged (mold, burn marks, major tearing or shredding),	consult with a professional paper conservator to determine what treatment is necessary.

9. *When should I make “preservation copies”?*

Preservation copies are photocopies, microform copies, or digital copies of documents. They are produced so that researchers don’t have to handle the originals. Having preservation copies helps prevent theft and damage to collections that can occur from overuse.

Note: Preservation copies are different from “surrogate” copies, which literally replace the originals.

It never hurts to have a set of preservation copies for any collection. However, the cost of making them is so high that preservation copying should be done on a very selective basis. Only those collections that are the most important and receive the heaviest use should be considered for preservation copying.

Light-sensitive items, such as albumen prints, should not be photocopied. For further guidance on preservation copying, see Conserve-O-Grams no. 19/4, 19/10, and 19/11.

10. *May I cull materials during processing?*

Yes. Materials ordinarily are identified for disposal during the appraisal process (see Section E, “Appraisal”). However, duplicates and extraneous material may be identified during the processing phase. Those materials may be culled from the collection. Consider the materials to have been accessioned in error. Thoroughly document the removal of the materials and place the documentation in the accession folder. This action is not a deaccession. Don’t follow the standard deaccessioning procedures.

It’s not unusual for a collection to contain multiple copies of the same document. Unless these duplicates have some kind of intrinsic value, it’s permissible to keep just two or three copies. Dispose of the rest.

Follow the disposal procedures for permanent park records. Consult with the park’s administrative officer to see how the park handles the disposal of such records. Remember, however, that culling is an option – it is not mandatory.

Also, be cautious about culling materials from pre-20th century collections. It is all right to cull recent photocopies of documents that have found their way into the collection—but rare handwritten (“fair”) copies or “press” copies dating from the same time period as the documents they duplicate might be worth keeping.

Culling collections during processing is not a substitute for the adequate appraisal of records.

11. *What are some examples of the types of materials that can be culled?*

Types of materials that can be culled include:

- blank sheets of stationery
- inconsequential notes
- unannotated slips of paper used long ago as bookmarks within file folders
- empty and unmarked envelopes
- empty binders
- general publications with no associational value
- documents with privacy information that contributes no value to the collection

Note: It is conceivable that material culled from archival collections may have artifactual value. A ream of blank stationery that got filed with an archival collection may not have any archival value and should be culled. However, depending on its age, if it has a particularly unusual or interesting letterhead, it may have artifactual value. In that case, it may be appropriate to retain one or two sheets in the collection and recatalog the remainder as a non-archival history object.

O. Processing And Preservation—Paper-Based Documents

1. *How should I refolder and rebox paper-based documents?*

Unless a collection is accessioned in pristine condition, it's usually advisable to:

- transfer documents from their original file folders
- place them in acid-free file folders
- house the files in acid-free archives boxes
- remove oversized and non-textual records (see Section O)
- take steps to preserve any damaged or fragile documents that you encounter (see Section N)

Don't number the documents. Don't write on the documents for any reason.

2. *What size folders or boxes should I use?*

Use either letter-sized or legal-sized acid-free folders and boxes, depending on the nature of the collection. Collections often contain a mix of letter-sized and legal-sized documents. You should avoid folding legal-sized documents to make them fit into letter-sized folders and boxes. For this reason, legal-sized folders and boxes are preferred—even if a collection is composed predominantly of letter-sized documents. The snug fit of a letter-sized box can cause damage to the documents. Letter-sized storage materials, however, are less expensive than legal-sized materials.

3. *Should I remove paper clips, staples, and other fasteners?*

If at all possible, try to remove metal paper clips, binder clips, pins, brads, Acco fasteners, staples, and rubber bands from documents as you process collections—especially if they are rusty or doing obvious damage.

Take great care when removing staples. To avoid damaging the document, don't rip a staple out from the front by using a standard office staple remover. Instead, turn the document over. Use a flat-bladed archival staple remover. Fold back the ends of the staple so they are sticking straight up. Then turn the document back over. Slide the blade under the staple and gently slide it out of the document.

4. *Should I remove documents from binders?*

Yes. If it's practical to do so, remove documents from three-ring binders, and place them in file folders. Examine the binders carefully to determine if:

- the title on the binder as a whole represents the file unit title, *or*
- various tabs in the binder represent file units, *or*
- the binder is actually part of a larger file unit

5. *How should I handle multi-page documents?*

If multi-page documents are contained in a folder with other documents, they may need to be fastened in some way. If they aren't paginated, they can easily get mixed up with other documents in the folder. You can fold a sheet of bond paper in half (like a mini-file folder) and slip the document in that, or use interleaving sheets to separate documents. Alternatively, you may fold a very small piece of bond paper over one corner of the multi-page document as protection. Then place a stainless steel paper clip over top of the bond paper. You should only do this, however, if the document is not so thick that a clip would create impressions in the document.

6. *Can I break materials into multiple folders if the original file folder is too full?*

Yes. If the original file folder is overstuffed, don't transfer the entire contents to a single new folder. Instead, break up the contents into multiple folders that don't exceed 1 inch in thickness. As explained in Section K, this is still just one file unit. It doesn't matter how many file folders are needed to contain the materials. For example, a file unit entitled "Correspondence, July 1928" has to be broken up among three folders. It remains a single file unit even though it is contained in three folders. The titles on the folders should indicate that the file unit is foldered in sequence:

- "Correspondence, July 1928 (Folder 1 of 3)"

- “Correspondence, July 1928 (Folder 2 of 3)”
- “Correspondence, July 1928 (Folder 3 of 3)”

7. *How should I label file folders?*

Write the folder title on the upper flap of the folder, using a soft lead pencil. Titles should contain the following information:

- catalog number (from ANCS+ Collection Management Module catalog record) or local collection number (from ANCS+ Archives Module entry)
- collection title
- series title (if applicable)
- subseries title (if applicable)
- file unit title (if the file units are arranged under an alpha-numeric or other type of code, then that code designation is the file unit title; if the file unit title is a personal name, then put the last name first)
- the sequence of the folders (Folder 1 of 3, Folder 2 of 3) if the file unit is broken down into two or more file folders
- a consecutive number (acceptable but not necessary)

File units that are arranged properly, according to a clear filing scheme (alphabetical, chronological), don't require consecutive numbering. The number is superfluous. Moreover, the number of file folders is liable to change. For example, documents in a particular folder may become brittle and worn with time and use. It may be necessary to insert them into protective polyester sleeves. These will expand folders and may make it necessary to divide file units into multiple folders. This, in turn, would necessitate re-numbering all subsequent folders. Collection titles, series title, and file unit titles are permanent and immutable. However, the number of file folders can change for a variety of practical reasons. Thus, numbering all folders as a matter of routine can be an unnecessary exercise.

It's permissible to abbreviate titles, if that is necessary to fit all recommended information onto the folder label. The George Washington Carver Papers, for example, could be abbreviated as the “Carver Papers.” This abbreviation is appropriate only in the pencil titles on the folders themselves. Enter only full, official titles into ANCS+.

8. *Should I copy everything written on the original folder?*

Not necessarily. Enter only the information that pertains to the actual title of the file unit. File folders often have little personal notes, names, telephone numbers, and other jottings. These have nothing to do with the title of the file unit or the content of the folder. Don't attempt to copy or preserve such extraneous information.

Notes may appear on the folder that seem to be connected with the content of the file unit. These would be like marginalia, only on the folder as opposed to the margins of the documents themselves. You may copy or save the part of the folder containing that writing. If you save a portion of

an acidic folder for this reason, place it in a protective Mylar sleeve. Keep it as part of the file unit.

9. How many file folders should I place in a box?

Only put the number of folders in a box that will sit vertically, comfortably resting on the bottom fold. There should be enough folders in the box to keep the folders from sagging, but not so many that the box will bulge.

If you don't have enough folders to fill a box completely, insert a spacer board to keep the folders upright. (A spacer board is a length of acid-free corrugated board. It can be folded to the desired size and inserted in a box to create a false back, against which folders can rest.) Spacer boards—also called “document support spacers”—are available through archival supply catalogs.

10. May I mix files from different collections in the same archives box?

No. Even if you don't have enough files from a particular collection to fill an archives box, don't mix collections. Never box different collections together.

If you're working with a very small collection, you may not have enough folders to fill a box. You may also have boxed all but the last two or three folders of a larger collection. In these cases, you have two options

- Use a spacer board, as described above.
- Use a smaller box. Archives boxes with a depth of only 2 5 inches are available through archival supply catalogs.

11. How should I label the boxes?

As arrangement and processing are underway, you may label boxes temporarily. Write the:

- catalog or local collection number
- series title
- box number

Write lightly in pencil on the part of the box that eventually will be covered by the permanent label. For flip-top archives boxes, this would be on the narrow side that would be shelved facing out. This is the side where the top will flip from left to right. The label itself should be on the bottom half of the box. Place it beneath the flip top but above the finger hole or pull string. For records center cartons, the label should be in the center of the side that faces out when shelved.

After processing has been completed, go back and put permanent labels on all the boxes. Print or type the labels onto archival quality, self-adhesive labels. Include the following information:

- park name
- catalog number or local collection number
- collection title
- series, subseries, sub-subseries, sub-sub-subseries title, as appropriate

- title of first file unit in the box
- title of last file unit in the box
- box number

Note: Number boxes consecutively from the first box to the last box in the collection as a whole, regardless of series. Number each collection separately.

12. Should I keep the original folders, binders, and boxes?

No. After a collection has been refoldered and reboxed, throw them away or recycle them. They have no archival value.

The only exception would be for boxes, binders, or folders that contain information, such as notes that the records creator made.

<i>If...</i>	<i>Then...</i>
the notes have intrinsic value because they were written by a notable historic figure,	keep the relevant portion of the folder, binder, or box as part of the collection. It may be necessary to enclose that portion of the folder, binder, or box in a polyester sleeve.
the notes have informational or evidential value but no intrinsic value,	copy the relevant portion onto acid-free bond paper, keep the copy, and discard the original.

P. Processing And Preservation — Oversized Materials

1. How should I handle oversized materials?

Legal-sized or letter-sized textual records frequently will contain oversized documents. These typically have been folded to fit into a legal-sized or letter-sized folder or rolled and placed in tubes. Examples include:

- maps
- charts
- diplomas
- certificates
- posters
- newspapers
- bound volumes

- petitions
- architectural drawings
- engineering drawings

Ideally, oversized documents should be:

- removed from smaller folders
- flattened (unfolded); if folded documents are too brittle to be flattened safely, consult with a paper conservator
- placed in appropriate-sized folders and storage boxes

If they're so large that no folders or boxes can accommodate them, place them in map drawers. Separate them with interleaving sheets. (Because interleaving sheets can add weight and bulk, be careful not to overload drawers.) You may also place them onto acid-free rolling tubes.

Be sure to separate oversized materials by type. Store oversized blueprints separately, for example, from newspapers or oversized photographs.

2. How do I show the removal of oversized materials?

Whenever you remove an oversized item, you must replace it with a "separation sheet." See **Figure D.5**. The separation sheet should show the name of the document. For documents that don't have a formal title, give a short but meaningful description, such as "Map of Gettysburg, 1863," "Architectural Drawing, Park Visitor Center, 1968." The separation sheet should also show the title of the collection. As applicable, include the title of the series, subseries, and file unit.

Place the separation sheet in the exact location where the oversized item initially belonged. In addition, keep a copy of the separation sheet with the oversized document in its new location. It's necessary to have separation sheets in both places. Researchers going through the files will then know that a document has been removed. The original location will also be clear to anyone looking at the oversized document.

3. Why do oversized documents have to be removed?

Oversized documents often don't fit into legal-sized or letter-sized folders and boxes. Attempting to do so usually means folding the documents one or more times. Folding, unfolding, and refolding documents can cause damage. Documents become brittle and weak along fold lines and can easily break apart. Oversized documents can also become frayed and torn if edges stick out from file folders. Therefore, removal and flattening of oversized documents is a basic preservation action.

4. How should I file oversized items after they're removed from their original locations?

Typically, place oversized documents at the end of the collection from which they were pulled. Organize them by type—textual documents (documents on plain paper), architectural drawings, posters, bound volumes, and so forth. Arrange them in the same order as the collection as a whole.

For example, two oversized documents were removed from file A in Series I of a collection. Another oversized document was removed from file D of

that same series and another from file W of that same series. Three oversized documents were removed from Series II. The documents from Series I, file A would be filed first. The documents from Series I, file D and Series I, file W would be filed next. The documents from Series II would be filed last.

5. *Should I handle a group of oversized materials at the end of a collection as a series (or subseries or sub-subseries)?*

No. A group of oversized documents that has been separated from the original file doesn't constitute a series. The documents have no separate place in the collection's hierarchy. They are *housed* separately, but only as a practical measure, to help preserve them. Technically, they remain part of the file unit and series from which they came.

A group of oversized documents separated from the original files shouldn't be identified in the hierarchy. The documents shouldn't be regarded as a series or subseries. They shouldn't be described as any kind of unit within the ANCS+ Archives Module.

Such documents would be described specifically in the Archives Module only if the entire collection were being described down to the item level. This is almost never done. Even then, the item level description for each oversized document would be subordinate to its original file unit and series.

For further information on how to catalog and describe archival collections, see Sections R and S.

Q. Processing And Preservation — Photographs

When handling photographic materials of any type, it's important to wear white cotton gloves. The gloves protect the images from dirt and skin oils.

1. *How should I handle photographs that are part of standard textual files?*

Inks and papers in standard textual file units can damage photographs. Emulsions and chemicals from photographs can harm textual documents. If you encounter photographs in folders containing textual records, you should either remove the photographs (in the same manner as you would remove oversized documents) and replace them with separation sheets, or place them in protective sleeves and leave them in their original locations.

If you separate photos from the textual records, you should organize them by type (prints, negatives, slides) and arrange them in the same order in which they appeared in their original textual locations. When a photograph is removed from a textual file, replace it with a separation sheet (see **Figure D.5**). If possible, place a photocopy of the separated image with the separation sheet. Also be sure to keep a copy of the separation sheet with the photograph at its new location.

2. *What if photographs are attached to pages in a textual document?*

Unless they are doing damage or being damaged, leave them where they are. Place interleaving sheets between the pages. If you should note any damage being caused by the photographs, by the pages to which they are attached, or by the adhesives, you should consult with a conservator. (Also see Item 6, below, concerning procedures for handling photograph albums.)

3. *Should I add photographs that were separated from textual records to a series consisting exclusively of photographs?*

No. Some collections have series consisting exclusively of photographs. Ordinarily, this is because the person or organization that created the collection established a separate series of photos. For example, the records creator may have created albums of sequentially numbered images. Or the creator may have set up a working file of photos arranged by subject. That series should not be disturbed by adding photos that weren't there before.

Photographs located in textual files, for example, wouldn't have been part of that photo series. An individual photo may have been attached to an incoming letter and kept with that letter in a correspondence file. The photo is part of that letter. As such, it's part of the file unit and part of the series to which the letter belongs. Just because it's a photograph, doesn't mean it should be moved to a collection of photos that the records creator set up.

The reason for this goes back to the principle of original order. Separating a photograph or an oversized document from its original file unit doesn't alter the original file arrangement or series organization. Photographs and oversized documents are still part of their original file units and series in a technical or intellectual sense. Housing them separately is for preservation purposes only. It doesn't affect the archival hierarchy in any way.

4. *How should I house photographs?*

Separate photographic materials by type (prints, negatives, slides). Place them in protective envelopes or sleeves and store them in archival-quality photograph boxes. Slide storage boxes are small and narrow and should be placed into slide storage cases. The cases hold up to six boxes.

Place images in uncoated, inert, polyester (Mylar D) sleeves. The sleeves are expensive, but they allow you to view images without actually handling them.

You may also use paper envelopes and sleeves. Images have to be removed to be seen, but they are less expensive than polyester sleeves. They also do a better job of preventing the buildup of moisture and gasses because they are porous. Use unbuffered papers for color images. Use buffered papers for black-and-white images.

Store images less than 10" x 12" on edge. Don't stuff them so tightly into boxes that the boxes bulge. Don't store them so loosely that the photographs sag. Store oversized, fragile, or damaged images flat.

Place glass plate negatives into seamless, four-flap enclosures. Store them upright in document storage boxes lined on the bottom with Ethafoam. Nitrate negatives should be placed in cold storage. If possible, replace nitrate negatives with safety-base surrogates. Unless they have intrinsic value, destroy them after replacement—*especially if they are in poor and potentially unstable condition*. They should be handled as hazardous waste.

When nitrate negatives are replaced, the surrogate becomes the new object. You can destroy the original without having to deaccession it unless it has intrinsic value.

5. *Should I place loose photographs in albums?*

No. Envelopes and boxes are the appropriate storage media for prints, negatives, and slides.

6. *How should I process photographic albums?*

Ordinarily, photograph albums and scrapbooks are left intact. Trying to remove photographs that have been glued onto album leaves may damage the photographs. The albums may also have intrinsic value. This is especially true if they were compiled by a noted individual. The leaves may also contain captions, notes, and marginalia. Many of these old albums are quite stable; if they are, leave them intact and monitor for deterioration.

Photographs that were mounted in albums made of acidic paper may be in danger of being damaged. Consider the following steps:

- Make photocopies of each page of the album on acid-free paper.
- Make duplicate negatives and new prints of each of the photographs.
- Make digital scans of each of the photographs.
- Remove photographs from albums if this can be done without damaging the photographs. It may be necessary to consult with a professional photographic conservator to determine if the photographs can be removed safely.

R. Cataloging

1. *What's "cataloging"?*

Cataloging refers to the creation of a catalog record for archival collections. The catalog record should focus on the collection as a whole. Enter the catalog record in the ANCS+ Collection Management Module. The catalog record contains both collections management and basic descriptive data about the collection. It also serves as the principal accountability record for the collection.

Don't attempt to catalog a collection before it's arranged. Arrangement establishes a collection's hierarchy, and the cataloging of a collection is based on that hierarchy.

See Sections H and I for information about arrangement and hierarchical structure.

Note: Refer to Chapter 2, Section II of the *ANCS+ User Manual* for instructions on completing the fields on the collection level catalog record.

2. *Should there be a catalog record for each document in a collection?*

No. Don't catalog individual documents or "items." There should be only one catalog record for the collection as a whole. You may describe individual items in the Archives Module, but this is seldom necessary. In fact, avoid item level description if at all possible.

3. *What if a document is pulled from a collection to go on loan?*

To loan a document to another institution, the document will need to have a unique identification number. You can assign a unique identification number to a document for purposes of loaning it. Create an individual catalog record for that document, or create an item-level entry for that document in the Archives Module. Item level cataloging or description in this situation is done only to facilitate the loan process. It doesn't change the status of the document in any way. The document is still part of a larger collection, not a stand-alone museum object. Upon being returned at the end of the loan period, file it in its original location.

4. *Should there be a catalog record for each file unit in a collection?*

No. Don't catalog individual file units. There should be only one catalog record for the collection as a whole. You may describe individual file units in the Archives Module, but this is seldom necessary. As a time-saving alternative to full descriptions on each file unit, develop "folder title lists" or "container lists" in the Archives Module (see Section T).

5. *Should there be a catalog record for each series or subseries in a collection?*

No. There should be only one catalog record for the collection as a whole. There's only one catalog record regardless of the size of the collection or the number of series it contains.

Fully describe all series, subseries, sub-subseries, and sub-sub-subseries in the Archives Module (see Section S).

6. *What's the connection between archival hierarchies and archival cataloging/description?*

As explained in Sections H and I of this appendix, archival and manuscript collections are arranged *hierarchically*. They should be cataloged and described in the same fashion.

Hierarchical *arrangement* means that a collection is organized into subordinate groups. These groups are in turn broken out into subordinate groups, which in turn are broken out into individual items. The "top" of the hierarchy is the most general level: the collection as a whole. The "bottom" of the hierarchy is the most specific level: each individual document. In between the top level of the hierarchy and the bottom level may be groups of documents called "series." These are somewhat more specific than the full collection, but are still fairly general. Just as a collection may be organized into series, individual series may be organized into subseries. These are more specific than series, but more general than file units or individual documents. Subseries may be made up of individual file units, which are very specific. The file units are made up of individual documents or items, which are the most specific parts of the hierarchy.

Hierarchical *description* means that collections should be cataloged and described hierarchically, just as they are arranged. **Figure D.3a** shows a sample hierarchy for the Records of the XYZ Corporation. Description begins with a catalog record (in the Collection Management Module) for the records of the XYZ Corporation as a whole. Descriptions of the series and subseries can then be completed in the Archives Module. In other words, *the cataloging and descriptions proceed from the general to the specific, following the arrangement scheme*. The hierarchy serves as a sort of outline or table of contents.

You should describe each element in the hierarchy above the file unit level. You may draw up lists for file units. However, descriptions on individual file units and items is optional (and usually discouraged).

7. *What is the process for cataloging an archival collection?*

Follow these steps to catalog an archival collection:

- Enter a brief description of the collection as a whole into the ANCS+ Collections Management Module. This is the only catalog record for the collection that you should enter into the Collections Management Module.

- Copy your entry in the ANCS+ Collections Management Module over to the collection level screen of the Archives Module.
- Enter descriptions of each series in the collection, using as many series level screens as necessary. Each series gets its own screen.
- Enter descriptions of each subseries (or sub-subseries), if there are any. Each subseries gets its own screen.
- If you absolutely have to do it, enter descriptions for each file unit in the File Unit Level. Each file unit gets its own screen.
- If you absolutely have to do it, enter descriptions for each document in the Item Level.

Usually it's okay to stop at the series level. You need to describe most collections only at the collection and series/subseries levels. Going beyond that usually involves a lot of work and little gain.

8. *Do I have to enter the information from the top down?*

Yes. You have to go from the general to the specific. That is, you have to do your Collection Level description first. This is followed by Series Level descriptions, followed by Subseries Level descriptions, followed by File Unit descriptions (if necessary), and so forth.

Note: You can always go back and revise Collection or Series Level entries even after you have moved on to the Subseries or File Unit Levels. In other words, you have to *start* at the top and work your way down, but you can always go back up to the top to make revisions.

9. *Why must I enter information from the top down?*

Because the system is hierarchical, you have to enter information hierarchically. You enter the Collection Level description first, the Series Level descriptions second, and so forth. Your entries will be numbered so that all entries from the Collection Level down to the Item Level are linked. You have to do the Collection Level first because it will be the parent screen for all of the Series Level descriptions. You have to do your Series Level descriptions before you do subseries descriptions. This is because the Series Level screens are the parents for the Subseries Level screens. The same principle applies as you move down the hierarchy to the File Unit and Item Levels.

S. Description

1. *What's description?*

Description refers to written summaries of a collection and its series, subseries, and other components. You enter these descriptions in the ANCS+ Archives Module. The collection level description also appears in the catalog record, but the descriptions of series, subseries, and other components appear only in the Archives Module.

2. *How do I write a Collection Level description?*

To write a Collection Level description, you need to focus on three critically important fields:

- organization/arrangement
- scope

- history

Note: Refer to Appendix F of the *ANCS+ User Manual* for instructions on completing the other fields on the Collection Level record.

Organization/Arrangement (Collection Level)

List the series that make up the collection. Some small collections consist of file units that aren't organized into series. Indicate whether the file units are arranged alphabetically, numerically, chronologically, or according to some other filing scheme.

Scope (Collection Level)

First, list examples of the types of documents that appear most frequently in the collection. Examples include correspondence, reports, maps, architectural drawings, engineering drawings, photographs, newspaper clippings, and sound recordings. Second, provide a one paragraph overview of the collection. Cite the sorts of activities that are documented and examples of specific topics and highlights.

History (Collection Level)

For organizations, provide a brief history of the organization that created the records. For personal papers, provide a biography of the person that created the records. For example, provide a brief biography of Thomas Edison for a collection of Thomas Edison's personal papers. Provide a brief corporate history of the Thomas Edison Company for a collection of the company's records. Ordinarily, the histories or biographies should be no more than one to four paragraphs. In addition, you may want to include a time-line of dates and events pertaining to the records creator—perhaps as an appendix—but this is optional.

3. How do I write a Series Level description?

Follow the same basic procedure used for writing a Collection Level description. Treat each series as if it were a mini-collection (with some slight variations). Focus on three critically important fields:

- organization/arrangement
- scope
- history

Note: Refer to Appendix F of the *ANCS+ User Manual* for instructions on completing the other fields on the Series Level record.

Organization/Arrangement (Series Level)

List the subseries that make up the series. Some series consist of file units that aren't organized into subseries. Indicate whether the file units are arranged alphabetically, numerically, chronologically, or according to some other filing scheme.

Scope (Series Level)

First, list examples of the types of documents that appear most frequently in the series. Examples include correspondence, reports, maps, architectural drawings, photographs, newspaper clippings, and sound recordings. Second, provide a one paragraph overview of the series. Cite the sorts of activities that are documented and examples of specific topics and highlights.

History (Series Level)

You only need to complete the history field in the Series Level screen under certain circumstances. Provide historical information if series are based on specific functional units or events.

For example, suppose the records of a corporation are broken out by series for the various divisions of that company. There's a series for the Research Division, a series for the Manufacturing Division, and so forth. In such cases, it's appropriate to provide a one or two paragraph history of that division.

Another example would be the personal papers of an individual. These could contain series based on specific events or eras in that individual's life. There could be a series of papers on the person's military service, or exploration of the South Pole. Then it's appropriate to provide a paragraph detailing those phases of that person's life.

Don't provide historical information if the series are based simply on the types of documents. A series of correspondence, a series of reports, or a series of photographs doesn't require a history.

Remember: You must use unique titles. No collections among your holdings should have the same title. Within a given collection, no two series should have the same title. Within a given series, no two subseries should have the same title. See Section I, Question 4 for further information. For further information on standards, see the Society of American Archivists' publication Describing Archives: A Content Standard (DACS).

4. *Should I enter descriptions in the Archives Module for all series, subseries, sub-subseries, and sub-sub-subseries in a particular collection's hierarchy?*

Yes. You must individually describe, in the Archives Module, every series, subseries, sub-subseries, and sub-sub-subseries identified in a collection's hierarchy.

For the Subseries, Sub-Subseries, and Sub-Sub-Subseries Levels, follow the same descriptive procedures as for the Series Level.

5. *How do I write a File Unit Level description?*

Complete the basic fields (title of file unit, file unit number). The only other information needed is a one-or-two line overview of the content of the documents contained in the file unit.

Note: Refer to Appendix F of the *ANCS+ User Manual* for instructions on completing the other fields on the File Unit Level record.

6. *Are File Unit Level descriptions required?*

No. File unit description may be done at the discretion of the individual curator or archivist, but most of the time it's unnecessary to provide full descriptions of each file unit. Researchers should be able to find the files

they need if:

- a series (or subseries) is well described, *and*
- the file units are clearly arranged

It's extremely inefficient to describe each file unit. For all but the smallest collections, it involves an enormous amount of time-consuming, labor-intensive effort. This effort only produces minutely detailed descriptions that provide little added value.

Instead of describing each file unit, prepare folder title lists or container lists (see Section T). These are a much more efficient alternative to full file unit description.

7. *Are there situations where file unit description is recommended?*

Yes. Associated records include project files in such fields as archeology, paleontology, geology, and biology. The records for each project should be treated as a single file unit, regardless of the number of folders it might contain. File unit descriptions for each of these projects may note the title of the project, the subject or purpose of the project, the location where the project took place, the project dates, the principal investigators, etc. It should also note the accession number (which will link the file unit to any associated objects) and the storage location (if the file unit is co-located with the objects at an off-site repository). For further information, see Section M, "Handling Resource Management Records." For an example of a finding aid describing archeological records down to the file unit level, see **Figure D.6**.

8. *How do I write an Item Level description?*

An "item" is an individual document (a letter, report, photograph, architectural drawing, memorandum, etc.) regardless of the number of pages. Complete the basic fields (title of document, item number). The only other information needed is a one or two line overview of the document's content. For example, list the subjects covered in the document.

Note: Refer to Appendix F of the *ANCS+ User Manual* for instructions on completing the other fields on the Item Level record.

If a document doesn't have a formal title, enter a brief, functional title. A letter "title" should include the names of the sender and recipient, plus the date. Example: "Jones to Smith, October 1, 1908."

9. *Is Item Level description required?*

No. In most cases, it's unnecessary. Like File Unit Level description, Item Level description is time-consuming and labor-intensive. It's always an option, but you should choose it carefully. Having a finding aid that can direct a researcher to the proper file unit (or group of file units) may be sufficient.

10. *Is it more appropriate to do Item Level description of certain types of documents than others?*

Yes. Photographs, maps, and architectural drawings typically are more appropriate for Item Level description than regular textual materials. However, Item Level description is still optional. Only do Item Level description for photographs, maps, and architectural drawings when there's a real need for it.

If you choose to describe such materials to the Item Level, be succinct. Enter a short sentence fragment, citing only the most essential elements.

Then move on to the next image.

For example, “Franklin Roosevelt and Eleanor Roosevelt sitting on a mule,” is an adequate photo description. Include the date (if known) and the photographer (if important). You don’t need to describe what they are wearing, which way the mule is facing, and what the background scenery is like.

Note: If you do Item Level description of photographic prints, it’s unnecessary to do Item Level descriptions of the associated negatives (provided there is some way of connecting the prints to the negatives).

Generally, Item Level description is appropriate only for collections of the greatest historical significance. Very few collections in NPS custody rise to that level. The best candidates for item level description would be unusually rare or valuable documents—such as letters written by George Washington..

11. Can Item Level description help preserve collections by reducing the need to search through the files?

Not necessarily. There are two reasons why Item Level description isn’t a good strategy for preserving collections.

- “Heavy use” is a subjective term, but there are probably very few collections in NPS custody that are used so much that Item Level description would reduce the handling of individual documents in a meaningful way. Therefore, providing Item Level description for the purpose of reducing the need to open boxes and physically retrieve documents may not be worth the effort. The costs to reduce a collection’s use from 30 times a year to 25 times a year would vastly outweigh the benefits.
- Even when collections have been described to the Item Level, they still have to be handled. You should not assume that a researcher will decide not to see a document based on an Item Level description. A researcher is also likely to want to see other documents in that particular file unit. The materials will still be handled despite the Item Level description.

12. Should I make Item Level entries in the ANCS+ Item Level-Only directory?

No. The ANCS+ Archives Module includes both a hierarchical Archives directory and an Item Level-Only directory. The Item Level-Only directory was included in the Archives Module to accommodate Item Level-Only entries that were made in the past. Assuming that Item Level description for a particular collection is absolutely necessary, use the hierarchical Archives directory.

Don’t use the Item Level directory for any new Item Level descriptions. Enter Item Level descriptions into Item Level screens in the hierarchical Archives directory. In cases where a “collection” consists of one document, you should catalog that document individually in the Collection Management Module.

Use of the Item Level directory is not good archival practice. Item Level-only descriptions aren’t grouped logically under the appropriate file unit, series, and collection level descriptions. Instead, they are disconnected from each other and from their parent levels.

If you have Item Level entries in the Item Level directory, determine the collections to which those items belong. Transfer the descriptions to the hierarchical Archives directory as soon as possible.

13. *Why is it so important to enter Item Level descriptions in the hierarchically organized Archives directory and not the item level-only directory?*

Item Level entries in the hierarchically organized Archives directory are linked to the file units, subseries, series, and collections to which they belong. These entries reflect the actual physical organization and the provenance of the collection. The hierarchy also provides context for each document. This makes each item easier to understand and easier to find and retrieve.

Item Level entries in the Item Level directory exist in isolation, with no context, no provenance, and no organization. It's very difficult to find and retrieve items that are entered into the Item Level directory. You must know exactly what document you are seeking and exactly what keywords to use.

T. Folder Title Lists And Finding Aids

1. *What's a "folder title list"?*

A folder title list is also called a "container list." It's a list of all file units in a collection (or in an individual series, subseries, and so forth).

Preparing a folder title list is a highly-recommended alternative to entering a full description for each file unit in a collection. It takes much less time to do a folder title list than to do full file unit descriptions. Folder title lists also provide enough information to be very helpful to users.

You can enter folder title lists at either the Collection Level or the Series Level in the ANCS+ Archives Module. Enter them in the Container List supplemental record.

For technical and practical reasons, it's much better to provide a single folder title list for an entire collection. Use the Container List supplemental record at the Collection Level screen. If you include the folder title list as part of the Collection Level, it will automatically appear in printed finding aids. Folder title lists entered at the Series Level won't appear in printed finding aids.

Note: Refer to Appendix F of the *ANCS+ User Manual* for instructions on completing the Container List supplemental record.

2. *What are the two methods for preparing folder title lists?*

One method is to list the titles of every single file unit in each box. For example:

BOX 1: Aardvarks
Bears
Kangaroos
Leopards

BOX 2: Ocelots
Orangutans
Puffins
Zebras

The other method is to list the first and last file units in each box. For example:

BOX 1: Aardvarks to Leopards
BOX 2: Ocelots to Zebras

3. *Are folder title lists mandatory?*
4. *When is it appropriate to do a folder title list?*

No. Folder title lists aren't mandatory.

Doing folder title lists is a judgment call. Only do them when they can provide information that's not already covered in the basic collection, series, subseries, sub-subseries, or sub-sub-subseries descriptions.

A good candidate for a folder title list is a series of "Subject Files." Subject Files are files containing correspondence, memorandums, research papers, notes, and clippings. The material is on particular topics that were of interest to whoever created the records. Because a series might include dozens or hundreds of individual files, it's impractical to list every topic in the series description. Folder title lists are the most efficient and useful way of informing users of the specific subjects. Users can scan the list of subjects and select desired file units.

5. *When is it unnecessary to do a folder title list?*

In some situations folder title lists are superfluous. For example, suppose a series of memos is arranged in file units by year. All of the memos for a particular year are filed together. The title of each file unit is simply the year. There's no need to list each of the years if the user knows that the series contains one file unit for each year. The title of each file unit, in other words, is implied by the series description. At the most, a folder title list could facilitate retrieval by indicating the first and last file in each box. However, even that's not necessary.

6. *What's a "finding aid"?*

"Finding Aids" are reference tools. They can help NPS staff and outside researchers locate the files and documents they need in an archival collection. They are like a table of contents to an archival collection and can be in either hard copy or digital formats.

A finding aid is the basic tool for navigating through a collection. It should provide an overview of the structure and content of the collection. The standard elements of a finding aid are:

- history
- collection level description
- series and subseries level descriptions
- folder title lists

See Sections R and S for information on history and descriptions. See the beginning of Section T for information on folder title lists.

7. *Does NPS have a template for producing finding aids?*

Yes. A finding aid template exists in the ANCS+ Archives Module. You can generate finding aids from information entered into the ANCS+ Archives Module as part of the description process. Finding aids generated in this way require no additional keying of information. They are produced

from completed fields in the Archives Module.

You don't need to know anything about what a finding aid should look like or what it should contain. Just complete the various fields in the Archives Module as part of your cataloging and description activities. Include folder title lists in the Container List supplemental record on the Collection Level screen. Then choose the FindingAid/SGML function to automatically create a finding aid for the collection.

ANCS+ will copy data from the various fields into a finding aid that has been fully laid out and paginated. It includes a cover sheet, table of contents, and restrictions statement. The ANCS+ finding aid will be in Microsoft Word. You can send electronic copies of the finding aid to users. You can also print hard copy versions or post the finding aid on the Web Catalog.

An example of an ANCS+-generated finding aid appears in **Figure D.6**.

Refer to Appendix F of the *ANCS+ User Manual* for information on completing the fields in the Archives Module. This appendix also contains complete instructions for producing the ANCS+ finding aid.

8. What are EAD and MARC-AMC?

EAD stands for Encoded Archival Description. MARC-AMC stands for Machine Readable Cataloging Record – Archival and Manuscripts Control Format.

EAD and MARC-AMC are methods of coding catalog information about archival collections. They are used for posting to national, on-line bibliographic networks.

ANCS+ is capable of automatically putting data about NPS archival and manuscript collections into EAD and MARC-AMC codes. However, your park must have agreements with on-line bibliographical networks in order to post information about park collections. For further information, see the *ANCS+ User Manual*, Appendix F.

9. Is it mandatory to use EAD or MARC-AMC?

No. Coding ANCS+ data according to EAD or MARC-AMC format for submission to on-line catalogs is completely optional.

U. Access

This section focuses on access guidelines relating specifically to archives and manuscript collections in NPS custody. General guidance on access to NPS museum collections appears in the *Museum Handbook*, Part III, Museum Collections Use.

1. Are staff members at my park permitted access to park archival and manuscript materials?

Yes. Park staff can access park archival and manuscript materials but only for work-related activities. Curatorial staff don't need to withhold any documents from non-curatorial staff who are working on official assignments. Staff members who wish to conduct their own, personal research, however, shouldn't be granted special access. Instead, they should receive the same level of access as a member of the public.

Non-curatorial staff members should follow the same general rules as members of the public when handling archival or manuscript collections. These rules apply whether they're working on an official project or

conducting personal research:

- review original materials only in the museum program's research room
- have only one folder open at a time
- don't disturb the order of documents
- don't remove, add, write on, or otherwise mishandle documents

2. *Are non-NPS staff members permitted access to park archival and manuscript materials?*
3. *Is there one set of rules to follow when deciding whether members of the public are allowed to see certain documents?*
4. *What are the rules for determining public access to a collection of personal papers, private sector corporate archives, or other non-NPS documents?*
5. *What kinds of "personal privacy" information may I withhold from researchers?*

Yes. Non-NPS staff members, including members of the public and employees of other Federal agencies, may access park archival and manuscript materials. They must follow certain rules regarding access and certain procedures regarding use. See Section W for information on use of collections.

No. There are different sets of rules for different types of documents.

- For Federal Records (including NPS records), follow the rules set forth in the Freedom of Information Act. See Section V.
- For donated and purchased personal papers and private sector archives, there may be special restrictions established by the park

Restrictions on access should be outlined in the donor agreement or deed of gift. Accepting donations with restrictions, however, should be avoided. Donated and purchased archival collections that weren't created by a Federal agency aren't subject to FOIA. FOIA exemptions don't apply to such collections. See Section V.

Personal privacy information in Federal/NPS records may be withheld under the Freedom of Information Act (FOIA). See Section V. Personal privacy information in donated or purchased materials may be withheld under the terms of the donor agreement. It may also be withheld under the park's policy for protecting personal information.

Parks are legally required under FOIA to withhold NPS records that "would constitute a clearly unwarranted invasion of personal privacy."

Not every mention of an individual rises to this threshold. The sorts of information serious enough to be considered an "unwarranted invasion of personal privacy" would include:

- medical, psychiatric, employment, and religious counseling information on an identifiable individual or individuals
- information that places an individual in a false light
- information (including photographs) that could cause embarrassment (such as nude images)

6. *Can these types of personal privacy restrictions be placed on non-Federal records as well as Federal records?*
- As a matter of discretionary policy, parks may handle personal privacy information in non-Federal/non-NPS records, such as personal papers, in the same manner in which they handle personal privacy information in Federal/NPS records. However, these restrictions aren't required by law. Exemptions under FOIA don't apply to personal papers or other non-Federal archival materials.
7. *What types of restrictions may I place on "culturally sensitive" archival materials?*
- NPS-owned archival collections may contain "culturally sensitive" archival materials such as photographs, motion pictures, maps, location information, or other depictions of American Indians:
- burial sites
 - sacred sites
 - human remains
 - religious ceremonies
- Federal records can be withheld only if they are covered by one of the exemptions in FOIA. However, these materials may be withheld from researchers in the following cases if the materials are:
- Federal records/NPS records, and restriction is authorized by an existing Federal law (such as the American Indian Religious Freedom Act or the Native American Graves Protection and Repatriation Act)
 - donated (and non-Federal), and the donor agreement or deed-of-gift specifies that culturally sensitive documentation should be restricted
 - donated or purchased (and non-Federal), and the park determines that their release would violate the standards of the affected group
- Note:** For further information on restrictions made at the park's discretion, you should consult with DOI solicitors.
8. *How should sensitive information in personal papers or private sector records be withheld from researchers?*
- Follow the same basic procedures outlined in Section V for withholding FOIA-exempt information from Federal/NPS records.
9. *Should I withhold copyrighted materials from researchers?*
- No. You shouldn't withhold documents from researchers based on their copyright status. Copyright status may have an affect, however, on making copies of documents for researchers to keep. See Section X.
10. *Is it permissible to restrict or withhold Federal records that have previously been released?*
- Ordinarily, once a Federal record has been released, especially if it has been published, it becomes part of the "public domain." Materials in the public domain are open to everyone. In very rare cases, however, Federal records identified as "Records of Concern" may be withheld for national security reasons.
11. *What's the principle of "Equality of Access"?*
- The principle of "Equality of Access" gives the same level of access to all.

<i>If...</i>	<i>Then...</i>
you grant one member of the public access to a particular collection of documents,	you have to grant the same level of access to all members of the public.

Parks are legally obligated under FOIA to provide an equal level of access to everyone requesting to see Federal records. If Federal records aren't exempt from disclosure, then they are open to everyone. If Federal records are exempt from disclosure, then they are closed to everyone.

Follow the same principle with regard to non-Federal records in NPS museum collections.

12. *Can I restrict access to archival or manuscript materials if the purposes or methods of a person's research is questionable?*

No. It's not ethical to censor, judge, influence, or endorse anyone's research, arguments, or interpretations. Access must be granted on an equal basis to all researchers. You cannot withhold publicly available documents from individuals because you don't approve of their research. Neither can you give special access to individuals whose research you support.

For Federal/NPS records, it's illegal to withhold or release a document based on the intentions of the researcher. Instead, you are required by law to make your decision based solely on the content of the documents. Documents that are exempt from disclosure under FOIA guidelines must be withheld from everybody. Documents that aren't exempt from disclosure must be open to everybody regardless of the purpose, nature, or methodology of their research.

V. Freedom Of Information Act (FOIA)

1. *What are the rules for determining public access to NPS or other Federal records that are part of the museum collection?*

NPS records that have been accessioned into park museum collections, such as resource management records, are subject to the Freedom of Information Act (FOIA).

Federal agencies are required to release all information that's not specifically exempted under the Freedom of Information Act.

The Freedom of Information Act applies only to Federal records. Donated personal papers, corporate archives, or other non-Federal archival materials in your custody are not subject to FOIA review.

See **Figure D.7** for a copy of the Freedom of Information Act.

2. *What are some FOIA exemptions?*

FOIA exemptions include:

- security-classified information relating to national defense or foreign policy
- privileged or confidential trade secrets and commercial or financial information

- personnel files, personal medical files, or other materials, but only if disclosure of those records “would constitute a clearly unwarranted invasion of personal privacy”
- law enforcement records, but only if disclosure of those records would:
 - interfere with enforcement proceedings
 - deprive a person of a fair trial
 - reveal a confidential source
 - reveal investigative or prosecutorial techniques
 - endanger the life or physical safety of an individual
- records related solely to a Federal agency’s internal personnel rules and practices
- records of financial institutions
- privileged inter-agency or intra-agency memorandums or letters (for example, concerning management decisions that are under consideration but not yet made)
- records specifically exempted by statute, including records on:
 - protected archeological sites, including shipwrecks
 - caves
 - wells
 - endangered species

Note: FOIA exemptions include records already shielded by existing Federal laws. The Archeological Resources Protection Act of 1979, for example, presents disclosure of protected archeological sites.

3. What are the procedures for responding to a FOIA request?

Follow these procedures for responding to a FOIA request:

- Provide written response within 10 working days of receiving a FOIA request.
- If more than 10 days are needed to respond, notify the public affairs and FOIA officers at your park’s regional office immediately. Request an extension.
- The denial of all or part of a FOIA request must be signed by the Regional Director or by the regional FOIA officer or public affairs officer.

- Parks may recover costs (based on fee schedules established by the Department of the Interior) from the requestor if the response:
 - requires more than two hours of research, or
 - entails copying more than 100 pages
- Researchers are entitled to appeal negative decisions. They should file their appeals with the FOIA officer in the Washington Office. If a researcher's appeal is denied, the researcher may appeal that decision in the appropriate United States District Court.

For further information, consult the FOIA officer at your park's regional office or read 383 *Department Manual 15*.

4. How can FOIA-exempt information be removed from files or withheld from researchers?

There are two ways to withhold documents or information from release:

- If an entire document is exempt, you may remove the document from its original file location. Place it in an acid-free file folder, labeled "Restricted Documents from [file name from which document was removed]." Put a separation sheet in the document's original file location (see **Figure D.5**). Give the name and date of the document and the FOIA exemption that required the document's removal. Place a copy of the separation sheet with the document itself. Place the folder containing the withdrawn document behind the original folder.
- If only a portion of a particular document is exempt, then provide the researcher with a "redacted" copy. To do this, make a copy of the original document. Then either obscure the exempted information with a heavy black marker or cut out the exempted information. Copy the redacted copy (so that it's impossible to see the original information through the black lines). Indicate the FOIA exemption in the margin next to the area that was blacked out or cut out. Provide this copy—not the original document—to the researcher.

Always redact a COPY of the original document. Never cut out or black out information on the original document.

5. Do I have to conduct a new FOIA review every time a member of the public asks for a particular file or document?

No. Once a file or document has been reviewed and released, it becomes permanently available to anyone who requests it. There's no need to conduct additional FOIA reviews for materials that have already been released.

6. Should I handle all requests for information from archival and manuscript collections as if they are FOIA requests?

No. Follow FOIA procedures only when responding to requests that are formally identified in writing as FOIA requests. Other letters, e-mails, or telephone calls that you receive may be handled as routine inquiries. See Section U.

Even when responding to a routine request for information, **you must always follow FOIA guidelines when deciding what records can be released and what records should be withheld.**

Never release Federal records that are exempt from disclosure.

7. *Should I review research proposals to determine if it's appropriate to grant access to the records?*

No. FOIA is the only basis for determining whether or not a member of the public can see NPS records.

<i>If...</i>	<i>Then ...</i>
a document or file isn't exempt from disclosure under the FOIA,	release it to everyone who wishes to see it.
a document or file is exempt from disclosure,	withhold it from everyone.

The purposes of the requestor's research, the nature of the requestor's research proposal, and the requestor's research methodologies are irrelevant. The exemptions set forth in FOIA are the sole factor for determining release.

NPS records may never be withheld from an individual because of the nature of his or her research.

8. *Does FOIA apply to all archival and manuscript materials in NPS museum collections?*

No. FOIA is extremely limited. It applies only to certain types of Federal records—records created by Executive Branch agencies. Even within the Executive Branch, it doesn't apply to those offices that are actually part of the White House. This means that the records of all Executive Branch Departments, such as the Department of the Interior, are covered by FOIA. White House records, Congressional records, and Supreme Court records are not covered.

FOIA also doesn't cover:

- records of private sector corporations, non-profit foundations, or clubs
- personal papers of private individuals or families

Therefore, the only records in NPS museum collections that are likely to be covered by FOIA are NPS records.

9. *Are personal papers "records received by the Federal government" and therefore subject to FOIA?*

No. A collection of records may be owned by the Federal government, but that doesn't necessarily mean that they're Federal records. The papers of a private individual or the archives of a private sector corporation may be considered records. If they're accessioned into an NPS museum collection, they're the property of the Federal government, but they are not Federal records.

Federal records are records *created* by the Federal government, and they are records of Federal activity.

When a park accesses a collection of personal papers or corporation archives that it has acquired through donation or purchase, it's not creating

records. Instead, it's acquiring property. They're the papers of a private individual or the records of a private sector company, not the records of the Federal government even though the Federal government owns them.

The fact that this property happens to be a collection of records doesn't make it a collection of Federal records.

W. Use-Reference

This section focuses on guidelines relating specifically to the use of archives and manuscript collections in NPS custody. General guidance on use of NPS museum collections appears in the *Museum Handbook*, Part III: Museum Collections Use.

1. *Are researchers subject to any restrictions on using archival and manuscript collections?*
2. *When members of the public come to the park to conduct archival research, where should they work?*
3. *May researchers be permitted to "check out" files, in the manner that someone would check a book out from a library?*
4. *How should I configure a research room or research area?*

Yes. There are many restrictions that you may place on the use of archival and manuscript materials. These restrictions are outlined below. Researchers who fail to observe those restrictions may be prohibited from doing research in park facilities with original documents. They would still be entitled to purchase copies of publicly available materials.

Designate a separate room or clearly defined area for use by researchers. Don't place researchers at a staff member's desk or at a vacant table in the collections storage area.

No. Original archival materials should never be checked out. They may be placed on loan, following the same rules that govern loans of all NPS museum objects. An archival repository is not a lending library and researchers should never be allowed to check out original documents.

Follow these guidelines to set up a research room or research area.

Location of Research Rooms

- Research rooms or research areas may be adjacent to collection storage areas, but they must be separate from collection storage areas.
- Research areas should be close to collection storage areas. This minimizes the distance that archival materials will need to be transported for use. It also facilitates their quick and easy return to their regular storage locations.
- Research areas must be separate from collection storage areas to ensure proper security. This prevents researchers from having access to any archival materials other than those that they have specifically been permitted to use.

Contents of Research Rooms

- Research areas should be "clean." There should be no books, papers, files or other materials besides the documents that researchers have been authorized to use. This prevents archival materials that are brought to researchers from getting mixed up with other documents.
- Provide one or more worktables for researchers. Two or more researchers can be seated at the same table if they're working together

as a team. The team should be using the exact same documents at the exact same time. Otherwise only one researcher should be seated at a table at one time. Having two or more researchers at a single table runs the risk of getting papers from different collections mixed up. There are specially designed research tables with dividers to separate researchers (and the files they are using) from each other. These allow several researchers to work at the same table.

- Don't allow waste paper baskets or other trash receptacles near researchers. This prevents documents from being discarded by accident or through malice.

Environmental Conditions for Research Rooms

- Environmental conditions in research areas (heat, light, humidity) should be comparable to environmental conditions in collection storage areas.
- No food or beverages may be brought into research areas. Integrated Pest Management procedures should be implemented in research areas, just as they are in collection storage areas.

Security for Research Rooms

- Place lockers outside the research area, where researchers can store coats, hats, and briefcases. This is a security measure rather than a convenience for the researchers. It's intended to reduce opportunities for researchers to hide documents in their belongings and sneak them out of the research area.
- There must be a counter or desk for staff use in the research room. Situate it in such a way that staff can monitor all researchers at all times.
- Research areas should be secure. Grant entry only to authorized staff and authorized researchers. If a research area should abut a collection storage area, keep the doors locked between the two areas. This is especially important when researchers are present. Keep research areas locked or otherwise secured to prevent park visitors (other than authorized researchers) from gaining access to archival materials. This also prevents researchers from smuggling documents to someone outside the research room.

5. What procedures should staff follow when working with on-site researchers?

Staff are responsible for enforcing the research room rules and guidelines.

Retrieving Materials

Staff are responsible for retrieving and refiling all materials requested by researchers. Never allow researchers into the collection storage area to retrieve the papers they'll be using. Staff may pull several boxes of materials for a researcher at a time. However, the researcher may only use one box—and one folder out of that box—at a time. The researcher must put a folder back into the box before pulling another folder out. He or she must return everything to the first box and close it before opening the next box.

Monitoring

At least one staff member should remain in the research area at all times to monitor researcher activities. Staff should ensure that researchers are following the rules. In particular, staff should watch for any actions by researchers that might result in damage or rearrangement of documents. They should also be alert to any attempts by researchers to conceal documents on their persons or among their effects.

Inspecting

Staff should inspect all notes or other objects removed from the research room. Make certain that no documents are included among them.

6. *What procedures should researchers follow when they're in the research area?*

Researchers must follow these procedures when they're in the research area. Prohibit researchers from the research room if they fail to observe these rules:

- A researcher should use only one box at a time. No matter how many boxes of archival materials have been brought to a researcher, only one box may be opened at a time. Only one file folder from that box may be used at a time.
- Researchers must keep documents in the same order in which they found them. They should never move a document from one folder to another, or folders from one box to another. If researchers discover a file or document that has been misfiled, they shouldn't attempt to correct the situation themselves. They should report it to staff.
- Researchers should never write on archival materials.
- Researchers must handle individual documents carefully. If they're handling photographs or documents that are damaged or fragile, staff may require them to use gloves. The park should provide gloves to reduce the risk of damage. If researchers damage a document in the course of doing their research, they should report it to staff immediately.
- Researchers must never attempt to remove documents from the research room, unless museum staff give them permission to do so.
- If researchers are taking notes, they should use their own laptop computers. They can also write notes down on paper using *pencils* only. Never permit pens in the research area. Researchers must never use pens in the vicinity of original documents.
- Researchers are not permitted to have food, beverages, or smoking materials in the research area.
- Researchers should refrain from using cell phones or the Internet while in the research room. This is to avoid disturbing other researchers.

7. *What forms should I require researchers to complete?*
- Require each researcher to complete the following forms:
- Registration Form***
- Each researcher should complete a registration form before being permitted to use archival materials at the park. The form should include name, address, institutional address, research project, and publication plans. See **Figure D.8**. Upon completing the form, researchers should present both the form and a government-issued photo ID to a staff member. Write the type of ID and the ID's control number on the form.
- Request Form***
- Require each researcher to complete a request form for all materials he or she wishes to view. The form should indicate the researcher's name, the date of the request, and the specific boxes, series, or files being requested. Retain request forms indefinitely, to identify individuals who had access to particular materials. This is in case you discover any missing documents. A "paper trail" of research use can deter theft. It can also serve as evidence in court cases seeking to recover lost or stolen items.
- Copyright and Privacy Restrictions***
- Each researcher should read and sign the Copyright and Privacy Restrictions form before being permitted to use archival materials at the park. See **Figure D.9**.
- Access Policies and Rules Governing Use***
- Each park should prepare and post its own Access Policies and Rules Governing Use for researchers to read. See the sample list of rules, **Figure D.10**.
8. *Do researchers need to meet any age restrictions?*
- Archival repositories commonly prohibit individuals under the age of 21 from entering research areas and using original archival materials. Sometimes repositories make exceptions for college students working on class projects that require the use of primary sources.
9. *Should researchers make appointments before arriving to do archival research?*
- Appointments are recommended but not required. Researchers should contact museum staff before they visit in order to make sure that the:
- papers they are seeking are actually in park custody
 - papers in question contain the sort of information they are seeking
 - materials they wish to see are available to researchers and are not exempt from disclosure
- In addition, space constraints may make it advisable for researchers to make appointments to use the research area. Parks with limited space may be able to accommodate only two or three researchers at a time. Parks can handle researchers on a "first come, first served" basis. However, it may be fairer and more efficient for parks to schedule researchers in advance for specific blocks of time.

- 10. What other scheduling and logistical arrangements should parks make in order to protect and facilitate the use of archival materials by outside researchers?*

Parks may make additional scheduling and logistical arrangements to facilitate researchers and protect the collections:

Pull Schedules or Retrieval Schedules

- Parks may establish “pull schedules” or “retrieval schedules,” especially if there is heavy demand for archival materials. These schedules set certain times during the day as deadlines for researchers to submit requests for archival materials. The times are usually at least once in the morning and once in the afternoon. Requests received by those times ordinarily should be filled within the next one or two hours, depending upon demand. Researchers missing a deadline would have to submit their requests for the next deadline.

Supplies

- To protect the documents, parks should have supplies of white cotton gloves and pencils. Make these available for researchers to use when working with original documents.
- As a security measure, parks may also wish to provide researchers with notepaper or note cards. These should have holes punched in the upper right corner. When researchers are leaving the research room, staff can suspend a sheaf of pages or cards by inserting a pencil through the hole. Any original documents that might have been hidden among the notes would then drop out.

Use Copies; Reference Copies

Particular collections (or portions of collections) may be damaged, fragile, or receive exceptionally heavy use. Parks may choose to make photocopies, microform copies, or scanned digital copies of those materials. Researchers could then use those “reference copies” instead of the originals. (**Note:** If you make reference copies of accessioned archival materials, you should not catalog them. They are just copies, and are not part of the collection itself).

- 11. How should parks provide copies of documents to private researchers?*

If at all possible, parks should provide facilities for making copies of documents, preferably at the researcher’s expense.

Don’t allow researchers to make copies themselves. They should indicate to staff which documents they wish to have copied. No matter what type of copies a researcher requests, he or she should complete a Researcher Duplication Form. See **Figure D.11**.

The park may adopt various procedures for making copies.

Small Numbers of Copies

Researchers may bring individual documents or files to staff in the research area for immediate copying. This depends on the availability of staff and photocopy machines. Preferably, the park should set up a cost-recovery program, so that researchers will bear the expense of copying. It might be possible to set up such a cost-recovery program through the park’s cooperating association or through the park’s budget office. The park may

waive fees, however, for very small numbers of copies that incur negligible costs.

Large Numbers of Copies

Researchers may need more than one or two documents photocopied during their visits. In these cases, it's advisable for them to use strips of white paper as "bookmarks." The paper indicates the location of specific documents or files that they wish to have photocopied. The staff makes the copies at a time that's convenient. These "bookmarks" should be placed so that they stick up above the file folders as they sit in a box. They're then readily apparent to staff. Researchers should write the title of the document or file unit on the bookmark (in pencil). This prevents confusion over what they want to have photocopied. The park should have cost-recovery procedures in place so that researchers pay for the photocopies themselves. The park may choose to withhold copies until full payment is received.

Photographic Copies

Researchers may desire actual photographs of textual documents, duplicate negatives of photographs, or copies of motion pictures or videotapes. In such cases, the park may set up agreements with commercial photo labs or video labs to make these copies. The park would transport the items to the lab and retrieve them after the copying is completed. The lab would then be responsible for collecting payment from the researcher. Alternatively, the park could pay the vendor and then charge the researcher through its cost-recovery program.

Note: Do not charge park staff for copies made in connection with official work assignments. If a park staff member wishes to conduct personal research while off duty, however, he or she should be subject to the same cost-recovery provisions as members of the public.

12. What are the procedures for responding to researchers who aren't on-site?

Instead of actually visiting the park, researchers may contact the park via regular mail, e-mail, or telephone. They may request information from or access to archival or manuscript materials in the park museum collection. Follow the procedures listed below when responding to those requests.

Response Format

- Responding by letter is always acceptable, but you may respond in whatever format the request was made. For example, you may respond to e-mail requests by e-mail and to telephone requests by telephone.

Response Time

- Respond as quickly as possible. Remember that FOIA responses must be sent within 10 working days.
- If providing a full answer would take a great deal of time, send an interim response. Provide as much information as possible and indicate that additional information will be contained in a follow-up response.

- If a researcher requests a few easily-provided facts, it's acceptable to provide those facts. In general, however, you shouldn't do the researcher's work. Focus on the availability of archival materials and on their general content. Provide finding aids for researchers to review. As a general rule, don't research questions that will take more than an hour or two to answer. Instead, advise the researcher to review the archival materials at the park, or purchase copies of relevant files.

FOIA Requests

- For formal FOIA requests for Federal/NPS records that are covered by FOIA, follow the procedures outlined in Section V. Withhold restricted information by applying the exemptions listed in Section V.
- If a researcher doesn't formally identify the request as a FOIA request, you don't have to follow the procedures outlined in Section V. This rule applies even if the request is for Federal/NPS records that are covered by FOIA. You should still respond, and you should still withhold restricted information by applying the exemptions listed in Section V.

Non-Federal Records Requests

- A researcher may request personal papers or private sector records that aren't Federal records. Apply whatever restrictions are contained in the donor agreement or in discretionary park policy.
- A researcher may submit a formal FOIA request for personal papers or private sector records that aren't Federal records. Advise the researcher that the materials in question are not covered by FOIA. Then respond as you would to any non-FOIA request for non-Federal archival materials.
- If you identify any archival materials that may relate to a researcher's request, provide a very brief description of those records. Include estimated page counts. Then, unless the materials are restricted, offer to make them available to the researcher in the park's research room. Explain to the researcher how he or she can order copies of the materials. When sending copies to off-site researchers, include a copy of the "Copyright and Privacy Restrictions" form. See **Figure D.9**.

Fees for Research Requests

- As noted in Section V, "Freedom of Information Requests," your park could establish a cost-recovery program that would require researchers to pay for research services, based on fee schedules established by the Department of the Interior. See *Museum Handbook III*, Chapter 4.

Tracking Research Requests

- Keep paper copies of incoming and outgoing letters and e-mails involving substantive information on archival holdings at your park.

- Keep track of all responses, regardless of format (letters, e-mail, telephone, face-to-face). Report the number of inquiries in your park's annual CMR submission.
-

X. Copyright

1. May I give researchers copies of copyrighted materials?

You may provide single copies of copyrighted documents to individual researchers if the:

- copyright holder has granted permission. *or*
- copies are made under the "Fair Use" provision of the copyright law

"Fair Use" permits the copying of documents without the approval or even the knowledge of the copyright holder. Fair Use covers such purposes as:

- research and scholarship
- news reporting
- criticism, parody, or commentary
- preservation of original documents (for example, making reference copies of a document for researchers to use in order to avoid wear-and-tear on the original)
- deposit of a copy in another research institution for scholarly purposes

2. Are materials in NPS-owned archival and manuscript collections copyrighted?

Sometimes they are. It depends on the type of material and the stipulations of donor agreements.

Federal records (such as NPS records) generally are not copyrighted. Letters, memorandums, speeches, notes, or other documents prepared by Federal employees as part of their official duties are *never* copyrighted. Those documents are in the public domain unless they are exempt from disclosure under FOIA. Documents received from other sources and incorporated into official files, however, may have copyright protection.

Personal papers, the records of private sector corporations or non-profit associations, and other donated or purchased materials may have copyright protection.

3. How will I know if a document has been copyrighted?

In many cases you won't know. Here are some useful indicators:

- Documents written by government employees as part of their official duties aren't copyrighted.
- Donors of personal papers or other non-Federal archival collections may assign all copyrights to the NPS. This should be documented in the donor agreement or deed of gift.
- Published documents usually include a copyright statement. Unpublished documents usually don't, but that doesn't mean they don't have copyright protection.

- Photographs may be stamped on the back with copyright information.
- Copyright protection may have expired on older documents. However, there are many variations, and it may be necessary to consult with a copyright lawyer before making a final determination. Generally, copyright protection has expired on:
 - published works that are more than 75 years old
 - unpublished works that are more than 100 years old

4. Who's responsible for determining if a document has copyright protection?

The researcher—not the park—is responsible for determining the copyright status of documents.

5. When should parks grant permission to publish copyrighted materials?

Parks should only grant permission when they are certain they hold the copyright on a particular document. The NPS Deed of Gift form explicitly states that copyrights are being turned over to the NPS. If there is a signed deed of gift that includes the copyright transfer, then it's acceptable to grant permission to publish.

In other cases, however, you should avoid either giving permission or withholding permission:

- No permission is needed to publish Federal records because Federal records cannot be copyrighted.
- No permission is needed to publish documents whose copyrights have lapsed, because they are in the public domain.
- The NPS doesn't have the authority to grant or refuse permission if the NPS:
 - knows that another party owns the copyright on a particular document
 - doesn't know if a document is copyrighted

6. What warnings or guidance should I give to researchers regarding the use of copyrighted materials?

Unless you're certain that a document is in the public domain, or that the NPS owns the copyright on a document, you should do the following:

- Warn the researcher that the document may have copyright protection.
- Advise the researcher that he or she is responsible for determining copyright status.
- Advise the researcher that he or she is responsible for obtaining permission to publish from the copyright holder.
- Ask the researcher to sign the NPS "Copyright and Privacy Restrictions" form (see **Figure D.9**)

- Refer the researcher to the Copyright Search System of the U.S. Copyright Office: <http://www.copyright.gov/records/>.
 - Refer the researcher to the National Archives Source and Permission Contact List: <http://www.archives.gov/research/>.
7. *Where may I find guidelines for determining if materials are likely to be in the public domain?*

Y. Use—Publications, Exhibits, Loans

1. *How should researchers cite NPS-owned archival materials that they have used?*

The standard method for citing documents in scholarly works is to go from the specific to the general (that is, from the individual document to the repository or agency). Under this formula, citations for NPS archival and manuscript collections should indicate the:

- title and date of the document
- title of the file unit
- title of the series/subseries/sub-subseries
- title of the collection
- name of the park
- National Park Service

NPS has also recommended providing citations that start with the general and move to the specific. Under that method, the order of the elements listed above would be reversed. Either method is acceptable.

Citations, however, are entirely the responsibility of the researcher, and researchers are under no obligation to follow NPS recommendations.

Note: A researcher's willingness to follow NPS citation recommendations must never be a factor in deciding whether to provide or withhold archival materials.

2. *May the park request a complimentary copy of publications based on NPS-owned archival or manuscript collections?*

The park may *request* a courtesy copy, but cannot require one. A researcher's willingness to provide a courtesy copy must never be a factor in deciding whether to provide or withhold archival materials.

Previous guidance recommended two complimentary copies—one for the park library and another for the museum collection. This may tax both the researcher's generosity and the ability of museum staff to handle additional materials. A single library copy is sufficient.

3. *Can I loan archival materials?*

Yes. Parks are permitted to loan documents to museums and other institutions. Parks may not loan archives to individuals. Loans of documents must follow the same procedures as loans of other types of museum objects. Follow the procedures outlined in the *Museum Handbook*, Part II, Chapter 5.

Although it's inappropriate to catalog each document individually, it's permissible to catalog individual documents for a loan. You'll then have a unique catalog number to cite in the loan agreement. Alternatively, you can complete an Item Level record in the Archives Module. You would use the local collection number (which would include the item number) on the loan agreement.

4. *May archival materials be used in park museum exhibits and in park interpretive programs?*

Yes, but only if strict guidelines are observed.

- Exhibit-quality color photographs can be taken of documents, for inclusion in displays. For both preservation and security purposes, this usually is preferable to displaying original documents.
- Original documents may be displayed, but only if they are protected by UV filters. The documents must be housed in conditions that meet all security and environmental standards. It's preferable to display photographs of documents rather than original documents. Documents placed on exhibit must have either a unique catalog number or a unique Archives Module number (see item 3, above).
- Documents can be published for general distribution only if:
 - they're Federal records
 - they're in the public domain
 - donor agreement/deed of gift has relinquished copyright ownership to the NPS
- Original documents and photographs of documents cannot be published or placed on exhibit if they're:
 - exempt from disclosure under FOIA
 - restricted under donor agreement/deed of gift
- Never allow visitors to handle original documents, unless they're authorized researchers working in the research area.

Z. Understanding the Language: A Glossary

Acquired archives: Organic collections created by a non-NPS organization as a routine part of doing business but removed from the physical custody of the originating institution and now in the physical custody of the NPS. These intact organic collections maintain their provenance and original order and are still referred to as archives, although legally severed from their non-NPS creator.

Active records: Official records needed and used for current business by NPS staff.

Administrative value: Refers to the archival material's usefulness for park management, as in the case of architectural drawings and plans useful for building repairs, maps necessary for landscaping or rescue, or other park records that indicate how an ecosystem has been affected over time.

Appraisal: (1) The act of assessing an archival or manuscript collection's value--including informational value, artifactual or intrinsic value, evidential value, associational value, and monetary value--using criteria such as age, subject content, contextual documentation, condition, quality, quantity, legal restrictions, organizational problems, public relations concerns, and associational nature. (2) The act of determining if a collection contains official (i.e., appropriate for disposition by NARA) or non-official (i.e., appropriate for park retention) records by consulting guidance such as *Cultural Resource Management Guideline*, Chapter 9; *Museum Handbook*, Part II, Appendix D, Section D; and *NPS-19, Records Management Guideline*. (3) Used in NPS museums to refer strictly to establishing monetary value.

Archival assessment: Evaluation of a park's total archival and manuscript collection management needs incorporating collection surveys, the production of collection-level survey descriptions, collections evaluations, and recommendations for action. Professional assessments facilitate records management and the care of archival collections in parks that have little previous experience with these issues.

Archival collections: (1) An organic accumulation of records created by an organization as a natural part of conducting business. Archival collections have a common provenance and a shared internal order original to the collection. See **collection**. (2) The total archival and manuscript holdings of a park. See **holdings**.

Archival quality: Permanent, durable, and non-destructive storage or copying materials or equipment suitable for use with archives. Also refers to long-lived (100-year-plus) documentation formats such as silver gelatin emulsions.

Archives: (1) The non-current records of an organization, with their original order and provenance intact, maintained by the original organization. (2) The organization that created and holds the records. (3) The physical building/room in which the records are held.

Archivist: A professional knowledgeable in archival theory and practice, who is responsible for the administration or management of archival and manuscript collections.

Artifactual value: refers to the collection or item's intrinsic value as unique or rare examples of material culture. This value relates to the age, format, process, media, condition, and quality of the material.

Artificial collections: See **non-organic collections** and **assembled collections**.

Assembled collections: Accumulations of documents, most often gathered from multiple sources by a collector, generally unrelated by provenance. The documents frequently are in the same format or related to the same topic. Assembled collections are sometimes referred to as "manuscript collections."

Associated records: All documentation generated by the activity of collecting or analyzing artifacts or specimens needed to effectively manage those related objects within museum property collections. (If there is no object or specimen, the record may not be “associated” but is instead a resource management record.) See also the definition in 36 CFR Part 79 and **resource management records**.

Associational value: Refers to the archival material's relationship, usually by ownership or use, to an eminent site-related individual or group or the material's relationship to a significant site-associated event.

Authority files: Published or unpublished lists of subject terms or names selected by a park for use in description. The lists may provide definitions, occupations, cross-references from variant versions of names or terms, and dates. Every park museum collection with archival holdings should have authority files for use in creating folder lists.

Cellulose nitrate film: A flexible film base used for motion picture film and photographic negatives between about 1890 and 1955. This film base self-destructs over time going through five stages of deterioration. The film should be handled with gloves, foldered in buffered sleeves, boxed, placed in Ziplock bags and removed to off-site (non-museum storage) storage in a freezer. See MH-I, Appendix M, Care of Cellulose Nitrate Film.

Collections: (1) An accumulation of manuscripts, archival documents, or papers having a shared origin or provenance, if organic; or having been assembled around a common topic, format of record, or association (e.g., presidential autographs), if non-organic. A collection may be any of the types of records described in section D (e.g., personal papers, organizational records, assembled collections, resource management collections, or sub-official records). (2) The total archival and manuscript holdings of a park.

Context: The circumstances of creation, history of ownership and usage, and original order of an archival or manuscript collection. A clear context gives a collection enhanced research value. See also **original order**, **organic collection**, and **provenance**.

Document: (1) Also called an “item,” the smallest complete unit of record or manuscript material accumulated to form a file (e.g., a letter, photograph, or report). A document may consist of multiple sheets or may have a recto (front) and verso (back), both of which carry information. Documents are also referred to as archival collections, papers, records, and manuscripts. Documents are most clearly described when referred to by their specific formats and processes (document types), such as albumen stereographs, outgoing correspondence, diaries, ink drawings, or field notebooks. (2) Any information in a fixed format, regardless of type.

Ephemera: A broad category of documents originally created for temporary or short-term use, such as advertisements, broadsides, invitations, packaging, posters, programs, schedules, and tickets.

Evidential value: Refers to the collection's ability to serve as historical or legal proof of an activity, event, procedure, or process since the record(s) are byproducts of these activities.

Federal Records Centers (FRC): Regional repositories that serve as official records centers for the National Archives.

File unit. The second-lowest level of archival arrangement, immediately above individual items or documents. File units contain all of the documents that the records creator filed together under a particular heading, classification, or topic. “File units” are not to be confused with “file folders,” which are merely physical containers for holding documents. A single file unit, in fact, may be so large that it requires multiple file folders.

Finding aid: (1) A broader term for any format of textual or electronic tool that assists researchers in locating or using archival and manuscript collections. Basic finding aids include guides (for example, repository, collection, and subject guides), descriptive inventories, accession registers, card catalogs, special lists (for example, shelf and box lists), indexes, and (for machine-readable records) software documentation. (2) The file

guides, indexes, registers, and filing system aids produced by the records creator, usually referred to as “control records” or “contemporaneous finding aids.”

Format: Refers to the document type or form, such as the document's size and shape or the configuration of the media and support. For a fuller description of document types or formats see the Getty Art History Information Program's *Art and Architecture Thesaurus*, 2nd edition, (Oxford, England: Oxford University Press, 1994) for a full hierarchical list of terms.

Genre: Refers to the document's style, content, and form, including the document's purpose (advertisements, presentation album), the document's viewpoint (panoramic view), broad topical category (landscape, still life, portrait, or street scene), method of representation (abstract, figurative), circumstances of creation (amateur works, student works), or function (dance cards, cigarette cards, death certificates). For a full list consult the *Thesaurus for Graphic Material II: Genre and Physical Characteristic Terms*, 2nd ed., 1993, Library of Congress Cataloging Distribution Service, Washington, DC 20541.

Holdings: The sum total of all archival and manuscript collections held in physical custody by a park. See also **archives, collections, physical custody, and repository**.

Holographic documents: Documents written in the handwriting (i.e., script) of the individual who created or signed them.

Informational value: Refers to the subject content of the archival collections, such as the people, groups, places, eras, activities, events, objects, projects, and processes documented.

Integrity: Refers to collections whose provenance and original order are intact and whose documentary context is complete.

Intellectual control: The mastery or command established over the informational and contextual content of archival and manuscript collections resulting from discovering and describing their provenance and original order and from the processes of arrangement and description.

Intrinsic value: See **artifactual value**.

Inventory: (1) A structured guide to an archival or manuscript collection that includes a brief history of the collection and a list of the materials arranged in series that functions as a type of finding aid. (2) A physical count of a collection conducted for accountability purposes. See MH-II, Chapter 4, Section A, Annual and Spot-Check Inventories and Audits. See also **survey**.

Items: Refers to individual documents or manuscripts. An item may be composed of multiple sheets or may have both a recto (front) and a verso (back) with writing or images on both sides.

Leaves: See **sheets**.

Lot: A group of related records cataloged with a single ANCS catalog record.

Manuscript collections: Groups of documents that have been assembled due to their individual literary or historical values. Manuscript collections are frequently contrasted with archives, which have a shared creator, a shared history of ownership, and a shared original order. See also **manuscripts**.

Manuscripts: Individual documents, primarily textual, that have literary or historical value. Manuscripts include a wide range of document types from correspondence, book drafts, and diaries to personal papers and resource management records. Manuscripts are often paper-based textual records.

Monetary value: Refers to the dollar value placed on rare or collectible manuscripts such as autograph letters or photographs. Monetary value is affected by all of the other values listed above.

Museum records: Official records generated by the museum property system to manage museum property, such as accession, catalog, inventory, and loan records. These records are appraised through NPS record schedule procedures (NPS-19). NPS-19 states that they are maintained in the parks as active official records for which the NPS is accountable to the National Archives and Records Administration.

Non-organic collections: A synonym for “assembled or artificial collections.”

Non-records: Documents not covered under the Federal Records Act; documents that are not considered records created or received by the Federal Government. (Note: Do not confuse archival collections received by the park through purchase or donation as “record material” by virtue of their having been “received” by the park. Such materials in fact “non-record” because they are not received as a record of Federal activity; rather, they are acquired as museum property).

Organic collections: Files routinely created as part of the day-to-day activities of a person, group, or organization. The records have a systematic relationship to each other that reflects their function and the activities and viewpoint of their creator. Organic collections are sometimes referred to as “archives.” They are said to exhibit integrity (their provenance and original order has been retained). Personal papers, organizational records (acquired archives), resources management records (including associated records), active records (including museum records), and inactive records may be organic. See **original order**, **provenance**, and **non-organic collections**.

Organizational records: See **acquired archives**.

Original order: The functional filing arrangement imposed on a document collection by its creator. The original order of collections can provide information not found elsewhere, such as when the creator received a communication, who reviewed a document, or what the sequence of an administrative activity was. Original order should be preserved or reconstructed in a collection as it allows for rapid arrangement, accurate contextual research, and additional insight into the record creator's methods and activities. If a collection has no order because of mismanagement or disaster, a decision to impose an order may be made only by an experienced archivist.

Personal papers: The records created or accumulated during a lifetime by an individual or family. They have an intact provenance and an original order. Personal papers differ from archives in that they are routinely removed from the custody of the collection creators and placed in external archival repositories, but they function as the archives of individuals and must be treated with the same respect as all organic collections. Parks may collect the personal papers of individuals related to the park, such as founding fathers, formative staff, or eminent individuals associated with the history of the site.

Photographs: A fundamental document type found in all categories of records from museum records to assembled collections. Photographs come in many formats (for example, from cartes-de-visites to stereographs), in a wide variety of vantage points (for example, bird's-eye-view, microscope images, satellite images), genres (for example, landscapes, still lifes, portraits), and processes (for example, silver gelatin, carbon). Photographs are formed by the action of radiation (usually light) upon a sensitized surface. While often thought of as a single process, photography is many hundreds of related chemical processes on a variety of supports, such as metal, paper, plastic, or glass.

Photomechanicals: Multiple copies of images made in ink from photographic printing plates. These permanent images include chromolithographs, duotones, halftones, offsets, photolithographs, photogravures, photoengravings, silkscreens, and Woodburytypes. Photomechanical reproductions were most commonly used for postcards and for illustrations in books, magazines, and newspapers.

Physical custody: Either temporary or permanent custody of an archival or manuscript collection. Physical custody does not entail intellectual control or copyright (the right to exhibit, publish, or prepare derivative works). This is particularly true for previously unpublished personal papers, organizational papers, or other historic manuscript collections. In general, the creator of the records holds the copyright. Nor does physical custody entail the right to dispose of portions of the collection without appropriate permission.

Provenance: (1) The entity (for example, person, family, organization, or office) that either created the records or accumulated them in the natural course of activity. (2) The history of physical custody of a collection or item. Note: Museum curators and archeologists use the related term “provenience” to refer to the source or origins of objects and to the exact location where the object was found or made.

Provenience: See **provenance**, definition 2.

Records: (1) All information fixed in a tangible (textual, electronic, audiovisual, or visual) form that was created by an organization as part of its daily business. (2) Two or more data fields that are grouped as a unit in machine-readable records. (3) Official NPS records, as defined by the Federal Record Act and described in DO-19 and NPS-19. These NPS records are organic collections of documentary materials created by the National Park Service to document the creation, development, organization, functions, policies, decisions, procedures, operations, or other routine activities of the NPS. They are made or received by NPS offices as a part of transacting business and preserved as evidence of the offices' actions or functions or because of the records' informational value. They may be active, in which case they are retained by the NPS, or inactive, in which case they are appraised via NARA records schedules and either disposed of or sent to a federal records center.

Records management: The process of determining the status, value, and disposition of park records throughout their lifetime (for example, official or non-official; active or inactive; appropriate to the park's scope of collections statement or not; relevant to the site's history or not; appropriate to the archival appraisal criteria or not; and appropriate for shipment to the FRC and NARA or not as listed on the records schedule). Records management also involves scheduling records for their ultimate disposition.

Recto: The facing page (front) of a single sheet of text or images.

Reformatting: Preservation duplication of original archival materials through the use of long-lived copy technology such as silver halide microfilms or large format digital files and computer output microfilms.

Separation Sheet: A form used to indicate the location of removed items within a collection and the reason for the removal.

Series: A group of documents arranged, file units, or volumes maintained together as a unit within an archival or manuscript collection because of their shared circumstances of creation, receipt, or use. Examples of series would include: 1) incoming correspondence, 2) outgoing correspondence, 3) project files, 4) annual reports, and 5) fiscal records. File units within a series usually conform to a single, consistent arrangement scheme (alphabetical; numerical; chronological, etc.). A series containing records arranged under two or more filing schemes should be divided into subseries, with each group of file units sharing a given filing scheme making up a subseries. Also see **subseries**. **Note:** If a collection is to be organized into series, there must be two or more of them. There is no such thing as a collection that is “organized” into one series. A collection may be made up of file units or individual documents that are not organized into series. If a collection is organized into series, however, then all file units or documents must fit into one of those series – even if a separate series must be established for a single item.

Sheets: Individual leaves of paper, for example a 5-page letter. An individual sheet may have both a recto (front) and verso (back).

Special collections: (1) Non-official collections of manuscripts, personal papers, non-federal corporate records, magnetic media, audio-visual materials, and other documents. (2) Non-textual records, such as magnetic or audio-visual materials.

Sub-series: A group of documents subordinate to a series, and maintained together because of their shared circumstances of creation, receipt, or use. It may be necessary to break a series up into two or more subseries because records created under the same circumstances serve different functions, cover different topics, or are arranged according to different filing schemes. See **series**.

Survey: A comprehensive and systematic review of a collection conducted either to obtain a brief overview of a collection or a park's holdings or to gain knowledge on a particular point, such as the amount of cellulose nitrate-based negatives and film in a repository, or the physical condition of a group of collections, or the level of conservation treatment needed by specific items. Surveys may be conducted on any level (item to repository) and on any topic (for example, the amount of stereographs in a repository or the level of documentation on women in the NPS).

Textual records: A broad category of written record including holographic, typed, word-processed, and mechanically printed documents, manuscripts, records, and archives.

Verso: The reverse side (back) of a single sheet of text or images.

Visual records: A broad category of records containing images including graphic, photographic, and photomechanical prints (in all formats from negative, interpositive transparency, and slide, to print); drawings; paintings; and watercolors. Visual materials may be found in all categories of records from official museum records to resource management records.

AA. Identifying Further Sources of Archival Training and Guidance

Seek further training through NPS archival training, your local universities, the National Archives and Records Administration's Modern Archives Institute, the Society of American Archivists' training courses, and through your regional archival organizations.

The Society of American Archivists offers regular training courses. Contact them at tel: 312-922-0140; e-mail at <info@SAA.mhs.compuserve.com> or <@cserve@internet:archives@miamiu.acs.muohio.edu> or via fax at 312-347-1452. Their address follows in the bibliography section.

For further guidance read Federal regulations governing document creation, use, and management including the following: the *Records Disposal Act of July 7, 1943, as amended* (44 USC 366-376, 378-380); the *Federal Property and Administrative Services Act of 1949, as amended* (44 USC 391-401); *Federal Property Management Regulations, Subchapter B, Archives and Records, Part 101-11, Records Management*; Department of the Interior *Departmental Manual*, Parts 380-384, Records Creation and Disposition and Part 411, Official Records; and the *Federal Property Management Regulations, Subchapter B, Archives and Records*.

BB. Readings: A Bibliography

Source Key:

Items marked with an * are available from: the Society of American Archivists, 600 South Federal,
Suite 504, Chicago, Illinois 60605, tel: 312-922-0140.

Items marked with a ^ are available from: the American Library Association, 50 East Huron Street,
Chicago, Illinois 60611, tel: 312-944-6780.

Items marked with an @ are available from: the Library of Congress Customer Services Section,
Cataloging Distribution Service, Washington, DC 20541-5017, tel: 202-707-9797.

Items marked with a # are available from: the National Archives and Records Administration,
7th & Pennsylvania Ave., NW, Washington, DC 20408, tel: 202-707-5240.

Items marked with a > are available from: the Commission on Preservation and Access,
1400 16th Street, NW, Suite 740, Washington, DC 20036-2217, tel: 202-939-3400.

Items marked with a % are available from: the Smithsonian Institution Press, 955 L'Enfant Plaza,
Room 7100, Washington, DC 20560, tel: 202-287-3738.

Items marked with a + are available (free) from: UNESCO, Place de Fontenoy, 75700, Paris, France

Items marked with a \$ are available from: the American National Standards Institute, 11 West 42nd Street,
N.Y., N.Y. 10018; tel: 212-642-4900 or via the Association for Information and Image Management at 1100
Wayne Ave., Suite 1100, Silver Spring, MD 20910; tel: 301-587-8202.

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Archival and Manuscript Collections Survey Form

COLLECTION TITLE (Creator/Format/Alternate Names/Accession/Catalog #s):

DATES (Inclusive & Bulk):

PROVENANCE (Creator/Function/Ownership & Usage history/Related collections/Language):

PHYSICAL DESCRIPTION (Linear feet/Item count/Document Processes/Formats/Genres):

SUBJECTS (Personal, Group, Taxonomic, and Place Names/Eras/Activities/Events/
Objects/Structures/Genres):

ARRANGEMENT (Series/Principle of Arrangement/Finding Aid):

RESTRICTIONS (Check and Describe) Donor _____ Privacy/Publicity _____ Copyright _____
Libel _____ No Release Forms _____ Archeological, Cave, or Well Site _____ Endangered Species
Site _____ Sensitive _____ Classified _____ Fragile _____ Health Hazard _____ Other _____

LOCATIONS Building(s), Room(s), Wall(s), Shelf Unit(s), Position(s), Box(es):

EVALUATION (Check and Describe Status) Official Records _____ Non-Official Records _____ Fits Park
SOCS _____ Outside SOCS _____ (Rate Collection Value: 1=Low; 3= Average; 6= High) Informational _____
Artifactual _____ Associational _____ Evidential _____ Administrative _____ Monetary _____

CONDITION (Check and Describe) Excellent _____ Good _____ Fair _____ Poor _____ Mold _____
Rodents _____ Insects _____ Nitrate _____ Asbestos _____
Water Damage _____ Other _____

OTHER (Please Describe)

Figure D.1 Archival and Manuscript Collections Survey Form (Sample) [Optional]

UNARRANGED RECORDS

- a. Financial Ledger, Vol. C
- b. Correspondence File, May-July 1910
- c. Financial Ledger, Vol. A
- d. Financial Ledger, Vol. B
- e. Diary, 1909
- f. Correspondence File, February-April 1910
- g. Diary 1912
- h. Financial Ledger, Vol. E
- i. Box of Cancelled Checks, 1911
- j. Diary, 1907
- k. Diary, 1908
- l. Correspondence File, August-October 1910
- m. Correspondence File, November 1909-January 1910
- n. Financial Ledger, Vol. D
- o. Diary, 1906
- p. Correspondence File, November 1910-January 1911
- q. Box of Cancelled Checks, 1910
- r. Correspondence File, August-October 1909
- s. Diary, 1911

Figure D.2a. Example of an Archival Collection That is Out of Order

HIERARCHY, AFTER RESTABLISHING ORIGINAL ORDER

SERIES I: CORRESPONDENCE, August 1909 to January 1911, with gaps
(arranged chronologically)

SERIES II: FINANCIAL LEDGERS
(arranged alphabetically by volume)

SERIES III: DIARIES, 1906-1912, with gaps
(arranged chronologically)

SERIES IV: CANCELLED CHECKS, 1910-1911
(arranged chronologically)

Figure D.2b. Unarranged Materials from D.2a Restored to Original Order

RECORDS OF THE XYZ CORPORATION

SERIES I: RECORDS OF THE PRESIDENT'S OFFICE

SUBSERIES I: Correspondence (arranged alphabetically by correspondent, and thereunder chronologically)

SUBSERIES 2: Policy Directives (arranged by year, and thereunder numerically)

SUBSERIES 3: Speech Files (arranged chronologically)

SERIES II: RECORDS OF THE MANUFACTURING DIVISION

SUBSERIES 1: Correspondence

SUB-SUBSERIES A: Incoming Correspondence (arranged alphabetically by correspondent)

SUB-SUBSERIES B: Outgoing Correspondence (arranged chronologically)

SUBSERIES 2: Production Records (arranged by department, and thereunder by shift)

SUBSERIES 3: Supply Records (arranged alphabetically by vendor)

SERIES III: ADMINISTRATION DIVISION

SUBSERIES 1: Personnel Records

SUB-SUBSERIES A: Employee Files (arranged alphabetically by name of employee)

SUB-SUBSERIES B: Correspondence (arranged alphabetically by name of correspondent)

SUBSERIES 2: Sales Records

SUB-SUBSERIES A: Sales Agents' Reports (arranged chronologically, and thereunder alphabetically by name of sales agent)

SUB-SUBSERIES B: Advertising Files (arranged by media type, and thereunder by market)

SUBSERIES 3: Research and Development Records (arranged by project number)

SUBSERIES 4: Accounting Records

SUB-SUBSERIES A: Ledgers (arranged by volume number)

SUB-SUBSERIES B: Financial Reports (arranged by fiscal year)

Figure D.3a Sample Hierarchy for a Collection of Organizational Archives

FRED SMITH PAPERS

SERIES I: CORRESPONDENCE (arranged alphabetically by name of correspondent, and thereunder chronologically)

SERIES II: DIARIES (arranged by year)

SERIES III: RESEARCH FILES (arranged alphabetically by subject)

SERIES IV: FINANCIAL RECORDS

SUBSERIES I: Bank Statements (arranged alphabetically by bank, and thereunder chronologically)

SUBSERIES 2: Canceled Checks (arranged alphabetically by bank, and thereunder numerically)

SERIES V: STILL PICTURES

SUBSERIES 1: Albums (unarranged)

SUBSERIES 2: Prints (arranged alphabetically by subject)

SUBSERIES 3: Negatives (arranged numerically)

SERIES VI: SOUND RECORDINGS (arranged by type, and thereunder chronologically)

Figure D.3 b Sample Hierarchy for a Collection of Personal Papers

SAMPLE HIERARCHIES/FILING SCHEMES FOR ASSOCIATED RECORDS

Most parks make or receive records relating to cultural history or natural history projects that occur in the park and recover objects or specimens that are accessioned into the park's museum collection. These are called "associated records."

These records are park records, regardless of whether they were actually produced by park staff, other NPS staff, contractors, or outside researchers working under park research permits. **Records for a particular project do not represent a stand-alone collection.** Project files should not be cataloged individually as separate collections, but should be managed as file units within larger collections.

Note: Even though project files should not be cataloged as separate collections, they may still be described individually at the File Unit Level in the Archives Module.

Note: Even though project files should be managed as part of larger collections, individual files may still be co-located at partner repositories with their associated objects. For files that are co-located, complete an outgoing loan agreement and indicate in the location field of the File Unit Level screen that the file is housed off site.

Associated records for a given discipline may be handled either as a collection or as a series within a larger collection encompassing all of the park's resource management records. Within the collection or series, however, parks will have to identify appropriate hierarchies and filing schemes based on particular circumstances. **Figures D.4b-D.4g** provide sample hierarchies and filing schemes that may be adopted.

There are only a few absolutes among the proposed hierarchical structures:

1. Associated records for any given project should be handled as project files—not as collections or series. Those files should be arranged within a single series or a single collection according to a uniform filing scheme. The recommended format would be to use accession numbers as file numbers, but the park may develop its own file designations.
2. If a park accesses associated records generated by its own staff or contractors, by the regional center, or by permitted researchers, it may create separate series reflecting this (as is shown in Figures D.4c and D.4d).
3. If a park accesses associated records produced exclusively in the park, as well as records produced through multi-park permits, it may create separate series reflecting this (as is shown in Figure D.4e).

Beyond these basics, parks will have to improvise and develop hierarchies based on what kinds of records are actually present. For example:

1. Suppose a park implements the hierarchy in Figure D.4c, to the extent of having one series for park-generated records and one series for center-generated records. There is no need for the park series to maintain the same subseries structure as the center series. The park series may be broken out into subseries and sub-subseries, but the series of center records may have nothing more than a simple file unit organization (as is shown in Figure D.4a).
2. Associated records accessioned by a park may fall into a series structure completely different from the "Reports Notes and Correspondence; Still Pictures; Maps" organization used in some of the samples. There may be additional series or subseries, fewer series or subseries, or completely different series or subseries. There is no universal template.

Figure D.4a Sample Hierarchies/Filing Schemes for Associated Records

SIMPLE FILE UNIT ARRANGEMENT

It is possible that a collection of associated records would be made up of file units that are not organized into series. This is the most basic hierarchy there is:

Local Coll. No. 5001: Records Associated with Archeological Projects at XYZ National Park

File Units no. 001 to ?: Individual file units, arranged numerically by accession number (or by any other arrangement scheme the park chooses).

Figure D.4b Simple File Unit Arrangement

BASIC SERIES ORGANIZATION

The series organization outlined below is just a suggestion. An actual series organization could take different forms, depending on the actual records and how they are maintained. Within this proposed structure, all of the park's projects files for a particular discipline are handled as a collection and are organized into series by physical type. Thereunder, the documentation on each project is kept intact, and should be described individually in separate File Unit Level screens in the Archives Module. In other words, the records are managed by project, but within a hierarchical structure.

Local Coll. No. 5002: Records Associated with Archeological Projects at ABC National Park

Series I: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged numerically by accession number.

Series II: Still Pictures

Subseries A: Prints:

File Units 001 to ?: Arranged by accession number.

Subseries B: Negatives

File Units 001 to ?: Arranged by accession number.

Subseries C: Slides

File Units 001 to ?: Arranged by accession number.

Series III: Maps

File Units 001 to ?: Arranged by accession number.

Figure D.4c Basic Series Organization

SEPARATE SERIES FOR PARK-GENERATED ACCESSIONS AND CENTER-GENERATED COLLECTIONS

In some cases, associated records may be managed partly at a center and partly at a park—but all of the materials, of course, remain park property. Since parks manage the assignment of accession numbers, it should be possible to coordinate between the parks and the centers using the park accession numbers, and thus maintain a single arrangement scheme for everything (regardless of location). That is, Accessions 00123 through 00129 could be at the park, Accessions 00130-00140 at the center, Accession 00141 at the park, and so forth. This could be reflected in that same order within a single run of file unit numbers in the Archives Module.

If it proves too difficult for parks and centers to keep track of accessions in this way, then collections could be organized into series based on whether park staff or park contractors carried out a project, or whether center staff or center contractors carried out a project. Assuming that both park-generated and center-generated records are organized in the same fashion as the materials in **Figure 4.c**, a collection divided into park- and center-generated archives would look like this:

Local Coll. No. 5003: Records Associated with Archeological Projects at XYZ National Park

Series I: Regional Center Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

Series II: Park Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

REMEMBER: Within this hierarchical structure, project files may still be described individually—but at the File Unit Level of the Archives Module, not as separate catalog records.

NOTE: The proposed series/subseries/sub-subseries structure is just an example of how a collection broken up into Regional Center projects and Park projects would work; it is not meant to be an immutable template. Also, because the breakdown would be based on park- or center-generated records (as opposed to managed), the hierarchy would not have to change if records were sent from the park to the center, or from the center to the park.

Figure D.4d Separate Series for Park-Generated Accessions and Center-Generated Collections

SEPARATE SERIES FOR PARK-GENERATED, CENTER-GENERATED, AND PERMITTED PROJECTS

It should be possible to use the park-assigned accession numbers to keep all associated records for a given discipline in serial order in the Archives Module. However, the fact that associated records for permitted research not always arrive in a timely fashion may complicate the coordination process. Just as parks might divide collections into series according to whether the work was done by center staff/contractors or park staff/contractors, they might also maintain a separate series for associated records generated through the permit process. It may be necessary to use placeholders to reserve space and maintain proper sequencing in the Archives Module if parks assign accession numbers before receiving records. The sample hierarchy below would be for a park that has assigned accession numbers to park, center, and permitted projects alike, and finds it easier to file/track them separately:

Local Coll. No. 5004: Records Associated with Archeological Projects at ABC National Park

Series I: Regional Center Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

Series II: Park Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

Series III: Permitted Research Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

Figure D.4e Separate Series for Park-Generated, Center-Generated, and Permitted Projects

SEPARATE SERIES FOR RECORDS GENERATED VIA MULTI-PARK PERMITS

Many natural history projects in NPS now involve multiple parks. In such cases, each park involved in a multi-park permitted project would get a copy of the final report, but the lead park would receive a full set of the project's records. Thus, a single park may have biological project files relating just to that park itself. A lead park could have records generated by one or more multi-park projects, involving numerous parks. To avoid confusion over park-only projects and multi-park projects, natural history collections could follow a hierarchy such as this:

Local Coll. No. 5005: Records Associated with Biological Projects at XYZ National Park

Series I: Park Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

Series II: Multi-Park Projects

Subseries A: Reports, Notes, and Correspondence

File Units 001 to ?: Individual file units, arranged by accession number

Subseries B: Still Pictures

Sub-subseries 1: Prints (arranged by accession number)

Sub-subseries 2: Negatives (arranged by accession number)

Sub-subseries 3: Slides (arranged by accession number)

Subseries C: Maps (arranged by accession number)

NOTE: These series structures are just suggestions. Actual organizational schemes would depend on what records are actually present and how they are actually arranged. Still, the basic division into series by Park Projects and Multi-Park Projects would be retained.

Figure D.4f Separate Series for Records Generated Via Multi-Park Permits

ASSOCIATED RECORDS FOR A GIVEN DISCIPLINE AS A SERIES WITHIN THE PARK'S COLLECTION OF RESOURCE MANAGEMENT RECORDS

Records associated with archeology projects at a particular park can be handled as a series within the Resource Management collection. Using the complex organizational scheme outlined in **Figure D.4d**, here is how a series of archeological records would fit into the hierarchy for a park's Resource Management Records:

Local Coll. No. 5006: Resource Management Records at ABC National Park

Series I: Land Records

- Subseries A: General Records
- Subseries B: General Grazing Files
- Subseries C: Family Grazing Allotment Records

Series II: Records Relating to Fires and Fire Management

- Subseries A: General Records
- Subseries B: Records Relating to Fires
- Subseries C: Fire Effects Studies

Series III: Construction and Maintenance Records

- Subseries A: Roads and Trails
- Subseries B: Buildings
- Subseries C: Grounds
- Subseries D: Water and Sewer
- Subseries E: Signs, Markers, and Memorials

Series IV: Records Associated with Archeological Projects

- Subseries A: Regional Center Projects
 - Sub-subseries 1: Reports, Notes, and Correspondence
 - File Units 001 to ?: Individual file units, arranged by accession number
 - Sub-subseries 2: Still Pictures
 - Sub-sub-subseries a: Prints (arranged by accession number)
 - Sub-sub-subseries b: Negatives (arranged by accession number)
 - Sub-sub-subseries c: Slides (arranged by accession number)
 - Sub-subseries 3: Maps (arranged by accession number)

- Subseries B: Park Projects
 - Sub-subseries 1: Reports, Notes, and Correspondence
 - File Units 001 to ?: Individual file units, arranged by accession number
 - Sub-subseries 2: Still Pictures
 - Sub-sub-subseries a: Prints (arranged by accession number)
 - Sub-sub-subseries b: Negatives (arranged by accession number)
 - Sub-sub-subseries c: Slides (arranged by accession number)
 - Sub-subseries 3: Maps (arranged by accession number)

Figure D.4g Associated Records for a Given Discipline as a Series Within the Park's Collection of Resource Management Records

Subseries C: Permitted Research Projects
Sub-subseries 1: Reports, Notes, and Correspondence
File Units 001 to ?: Individual file units, arranged by accession number
Sub-subseries 2: Still Pictures
Sub-sub-subseries a: Prints (arranged by accession number)
Sub-sub-subseries b: Negatives (arranged by accession number)
Sub-sub-subseries c: Slides (arranged by accession number)
Sub-subseries 3: Maps (arranged by accession number)

Figure D.4g continued

Archives and Manuscript Collections Separation Sheet

Document Type (map, newspaper clipping, photograph, etc.) Catalog/Accession Numbers

Document Description (Include collection name; dates; group organizational, personal, and place names; and topics [who, what, where, why, when, and how], etc.)

Item Originally Filed (Collection identifier: specific location, box #, folder #, drawer #, sequence in unit, etc.)

Item Now Filed (Specific location: room #, shelf #, box #, folder #, drawer #, sequence in unit, etc.)

Separated By:

Separation Date:

NPS Form 10-645
July 1995

Figure D.5 Separation Sheet (Form 10-645) [Optional]

National Park Service
U.S. Department of the Interior



FINDING AID

***RECORDS ASSOCIATED WITH ARCHEOLOGICAL PROJECTS
AT ANDERSONVILLE NHS
1970-1997***

SAMPLE FINDING AID
DO NOT USE FOR REQUESTING RECORDS

National Park Service

Catalog Number: ANDE 9804

Figure D.6 Sample Finding Aid

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HISTORY

Andersonville National Historic Site, located 10 miles northeast of Americus, in southwest Georgia, was established as a unit of the National Park Service on October 16, 1970, under Public Law 91-465. Its mission, as specified in the enabling legislation, is to "provide an understanding of the Civil War prisoner of war story, to interpret the role of prisoner of war camps in history, and to commemorate the sacrifice of Americans who lost their lives in such camps."

Included within the boundaries of the 515-acre park is the former site of Andersonville Prison, which was the most notorious prisoner of war camp during the American Civil War. Known officially during the Civil War as Camp Sumter, it was one of the Confederate Government's largest military prisons. Operating for 14 months in 1864 and 1865, Andersonville held more than 45,000 Union prisoners-of-war -- nearly 13,000 of whom perished because of disease, starvation, overcrowding, poor sanitation, or exposure. The harsh conditions at Andersonville -- while scarcely more severe than other prisoner of war camps operated by the Union and Confederacy alike -- excited such outrage after the war that its superintendent, Captain Henry Wirz, was court-martialed by the United States Army. Wirz was found guilty of war crimes, and executed in November 1865.

In addition to the prison camp, the park also includes the prison camp's burial ground (which was designated as a National Cemetery in July 1865, and which continues to inter the remains of deceased veterans), as well as the site of the camp hospital, the adjacent Confederate fort, and a National Park Service visitors center. Since 1998, the National Park Service has also maintained the National Prisoner of War Museum at Andersonville NHS; this museum tells the story of American prisoners of war throughout the Nation's history, starting with the Revolutionary War.

Archeological projects at Andersonville National Historic Site serve several academic, interpretive, and administrative purposes. They identify the existence of archeological resources, to help ensure their preservation and to prevent construction or other activity from damaging them. They provide data to help the park comply with Section 106 of the National Historical Preservation Act of 1966, which requires Federal agencies to consider the impact of their activities on historic places. They provide information on historic configurations of the prison camp, the fort, and the hospital, that can be used in interpretation and reconstructions. And they can yield artifacts that are accessioned into the park's museum collection and may be used for exhibits and research.

These archeological projects, therefore, add to the body of scholarship on Andersonville, for use by other archeologists, historians, teachers, students, and others. In addition, they contribute to a clearer understanding of the prison camp's history, and enhance the experience of those who visit the park. And they facilitate proper management of archeological resources, in order to minimize any impairment and to promote their preservation for future generations.

Notable projects include a series of studies conducted by the NPS Southeast Archeological Center between 1987 and 1990 to determine the nature, construction techniques, and location of the prison's stockade walls and gates, and to document prison conditions. The park used the findings of these studies to develop new or improved exhibits for the benefit of visitors, and to reconstruct a portion of the stockade walls.

SCOPE AND CONTENT

RECORDS ASSOCIATED WITH ARCHEOLOGICAL PROJECTS AT ANDERSONVILLE NHS 1970-1997

CATALOG NUMBER ANDE 9804

VOLUME 12 LF

DESCRIPTION Field notes, reports, correspondence, photographs, and maps relating to archeological projects carried out at Andersonville National Historic Site. Included are records produced by non-NPS archeologists conducting permitted research and submitted to the park under the terms of the permit, as well as records produced by NPS archeologists working on official projects. Most records are associated with accessioned objects. Records and objects associated with a single project will have the same park accession number.

ORGANIZATION Organized into 3 series: Series I, Reports, Notes, and Correspondence; Series II, Still Pictures; Series III, Maps.

PROVENANCE

RESTRICTIONS NO

ASSOCIATED

MATERIALS

HIERARCHY

- I. SERIES I: REPORTS, NOTES, AND CORRESPONDENCE
- II. SERIES II: STILL PICTURES
- III. SERIES III: MAPS

SERIES DESCRIPTIONS

I. SERIES I: REPORTS, NOTES, AND CORRESPONDENCE, 1970-1997 (bulk dates: 1970-1997)

Arranged numerically, with file numbers corresponding to park accession numbers, and thereunder arranged by subject.

Correspondence, final reports, draft reports, progress reports, trip reports, field notes, inventories, worksheets, photo logs, specimen logs, budgets, contracts, artifact analysis forms, stratigraphic profiles, and other papers relating to archeological projects at Andersonville NHS. Included are project files on surveys and tests prior to proposed construction activities, 106 compliance surveys, archeological monitoring, test excavations, and investigations of various locations throughout the park.

II. SERIES II: STILL PICTURES, 1970-1997 (bulk dates: 1970-1997)

Arranged by type (negatives, prints, slides), and thereunder by park accession number.

Black & white and color negatives, prints, and slides, relating to excavations, surveys, and other archeological projects at Andersonville NHS.

III. SERIES III: MAPS, 1970-1997 (bulk dates: 1970-1997)

Arranged by park accession number.

Maps, topographic maps, base maps, sketch maps, field maps, site plans, feature plans, grids, drawings, and tables showing artifact distribution by unit and level, relating to archeological surveys, excavations, and investigations at Andersonville NHS.

FILE UNIT DESCRIPTIONS

SERIES I: REPORTS, NOTES, AND CORRESPONDENCE

0001. ANDE 00062: SURVEY AND TESTING, 1977-1990

Cultural Resources inventory, conducted between January and June 1978, to locate and identify archeological features associated with Andersonville Prison and prehistoric sites on ANDE property. Survey carried out preparatory to proposed improvements to maintenance facilities and visitor support facilities outlined in General Management Plan, and other proposed development outlined in the Development Concept plan. Areas tested: Aboriginal site, Inner Stockade, North Gate, Middle Stockade, South Gate, Shed Hospital, Bake House, and development areas. Principal investigator: Ellen Ehrenhard, SEAC.

0002. ANDE 00166: SOIL RESISTIVITY STUDY OF THE HOSPITAL SITE, 1985-1992

Soil resistivity survey conducted at the Hospital Site by Rochelle Marrinan (Florida State University) and Kenneth S. Wild, Jr. (SEAC), July 1985.

0003. ANDE 00276: INVESTIGATIONS OF NORTHEAST CORNER FOR RECONSTRUCTION OF STOCKADE AND DEADLINE (WALKER 1987), 1986-1992

Archeological investigations of the Northeast Corner of the Stockade and Deadline, to determine the impact of reconstruction on the Stockade, conducted by John W. Walker of SEAC.

0004. ANDE 00322: INVESTIGATIONS OF NORTH GATE, 1989-1991

Archeological investigations of North Gate area, conducted in May-June 1989 by Guy Prentice, SEAC.

0005. ANDE 00355: INVESTIGATION OF SOUTHEAST CORNER OF THE INNER STOCKADE, 1990

Archeological investigation of Southeast Corner of the Inner Stockade, conducted by Guy Prentice (SEAC). The study located the Southeast Corner and an escape tunnel, and investigated units CC and DD (both of which were excavated previously by Ellen Ehrenhard).

**0006. ANDE 00378: SURVEY FOR VISITOR CENTER AND ROAD,
1990-1991**

Archeological survey for a visitor center and road, conducted February 1990 and September 1990 by Elizabeth A. Horvath (SEAC).

Included shovel testing in area of proposed visitor center and parking lot, shovel testing in Pecan Lane area, and test trenches for entrance road.

0007. ANDE 00379: COOKHOUSE LOCATION STUDY, 1989-1994

Investigation to determine location of cookhouse, prior to construction of Visitors Center. Initial walkover conducted by Richard Faust of SEAC; full investigation conducted by Elizabeth Horvath of SEAC. Study failed to reveal the location of the cookhouse.

**0008. ANDE 00409: INVESTIGATION FOR A NEW DRAIN LINE,
1991-1992**

Archeological investigation for new drain line in area of North Gate, to replace 1930s era drain line installed by Civilian Conservation Corps. Project conducted by John E. Cornelison (SEAC).

**0009. ANDE 00429: SECTION 106 COMPLIANCE SURVEY FOR
MAINTENANCE BUILDING, 1976**

Survey conducted as part of Section 106 compliance for maintenance building. The clearance effort concentrated on park property beyond boundaries of the fort, and revealed the location of a prehistoric site. Principal investigator: R. Faust, SEAC.

**0010. ANDE 00430: TEST EXCAVATIONS AT STOCKADE, 1973-
1977**

Archeological testing in the stockade area by Lewis H. Larson, Jr., and Morgan Ray Crook, Jr., of West Georgia College, under NPS contract no. CX500031635. Objectives of the investigation were to locate and record prison features and to provide preliminary details of construction techniques.

0011. ANDE 00431: HISTORIC STRUCTURES REPORT, 1970

Historic Structures Report by Andersonville Superintendent Edwin S. Bearss.

**0012. ANDE 00432: GUNBOAT STREET AND CEMETERY
SECTION "P" CLEARANCE PROJECT, 1981**

Archeological Clearance Project at Gunboat Street and Cemetery Section "P," conducted by Ellen Ehrenhard (SEAC).

0013. ANDE 00433: SURVEY OF TRACT 01-142 (1983), 1981-1985

Archeological survey of surplus parcel (Tract 01-142), conducted in August 1983 by Teresa Paglione and Richard Johnson of SEAC. The survey revealed the Civil War era Old Dixie Highway, the entrance road to the National Cemetery (ca. 1870-1932), and the Civilian Conservation Corps camp (1934-36).

0014. ANDE 00434: MONITORING OF PROVIDENCE SPRING PARKING AREA, 1986

Monitoring of Providence Spring Parking Area, overseen by John W. Walker (SEAC).

0015. ANDE 00435: MONITORING OF SEPTIC TANK AND DRAIN FIELD AT P.O.W. MUSEUM, 1986

Monitoring of septic tank and drain field area at Prisoner of War Museum. Project archeologist: Allen Cooper, SEAC.

0016. ANDE 00436: MONITORING OF HANDICAP ACCESS RAMPS AT SEXTANT'S HOUSE, 1988

Archeological monitoring of Handicap Access Ramps at the Sextant's House (also referred to as the Cemetery Lodge), conducted in November 1988 by Andrea C. Repp of SEAC.

0017. ANDE 00481: INVESTIGATIONS FOR NEW ENTRANCE ROAD AND VISITORS CENTER, 1993, 1993-1994

Archeological investigations for new entrance road and visitors center, involving shovel tests carried out in December 1993. Principal investigator: John Cornelison (SEAC).

0018. ANDE 00542: CEMETERY EXPANSION (SECTION "J"), 1996-1997

Archeological testing in area of proposed cemetery expansion (Cemetery, Section "J"). Principal investigator: John Cornelison, SEAC.

SERIES II: STILL PICTURES

0001. ANDE 00062

Negatives and prints.

0002. ANDE 00276

Negatives and prints.

0003. ANDE 00322

Negatives, prints, and slides.

0004. ANDE 00355

Negatives, prints, and slides.

- 0005. ANDE 00378**
Negatives and prints.
0006. ANDE 00379
Negatives and prints.
0007. ANDE 00409
Negatives and slides.
0008. ANDE 00430
Negatives, prints, and slides.
0009. ANDE 00432
Negatives.
0010. ANDE 00433
Negatives and prints.
0011. ANDE 00481
Negatives and prints.
0012. ANDE 00542
Negatives.

SERIES III: MAPS

- 0001. ANDE 00062**
0002. ANDE 00166
0003. ANDE 00276
0004. ANDE 00322
0005. ANDE 00355
0006. ANDE 00378
0007. ANDE 00409
0008. ANDE 00430
0009. ANDE 00432
0010. ANDE 00433
0011. ANDE 00435

CONTAINER LIST

Box 1

SERIES I: REPORTS, NOTES, AND CORRESPONDENCE

- Folder 1: ANDE 62 -- Ceramic Inventory by Unit
- Folder 2: ANDE 62 -- Lithics Inventory by Unit
- Folder 3: ANDE 62 -- Artifact Inventory by Unit
- Folder 4: ANDE 62 -- Map Inventory by Provenience
- Folder 5: ANDE 166 -- Correspondence
- Folder 6: ANDE 166 -- Research Design-Planning, 1984
- Folder 7: ANDE 166 -- Research Design-Planning, 1985
- Folder 8: ANDE 166 -- Final Report
- Folder 9: ANDE 166 -- Field Notes
- Folder 10: ANDE 166 -- Resistivity Survey Worksheets

Box 2

- Folder 11: ANDE 276 -- General Correspondence
- Folder 12: ANDE 276 -- Trip Report (Faust)
- Folder 13: ANDE 276 -- Research Design (Compliance)
- Folder 14: ANDE 276 -- Research Design (Planning)
- Folder 15: ANDE 276 -- Draft Report (Figures, Tables, Notes)
- Folder 16: ANDE 276 -- Draft Report (Partials of Final)
- Folder 17: ANDE 276 -- Draft Report (Complete Final)
- Folder 18: ANDE 276 -- Final Report
- Folder 19: ANDE 276 -- Identification of Wood Samples
- Folder 20: ANDE 276 -- Management Plan/Environmental Assessment
- Folder 21: ANDE 276 -- Newspaper Article
- Folder 22: ANDE 276 -- RFP and Related Correspondence
- Folder 23: ANDE 276 -- Budget Expenses
- Folder 24: ANDE 276 -- Field Specimen Log
- Folder 25: ANDE 276 -- Photographic Log (Camera 17894)
- Folder 26: ANDE 276 -- Photographic Log (Camera 17897)

Box 3

- Folder 27: ANDE 276 -- Journal Recording Notes (Prentice)
- Folder 28: ANDE 276 -- Loose Recording Notes (Walker)
- Folder 29: ANDE 276 -- Loose Recording Notes (Crew)
- Folder 30: ANDE 276 -- Transit Recording Notes
- Folder 31: ANDE 276 -- Excavation Unit Forms
- Folder 32: ANDE 276 -- Feature Forms
- Folder 33: ANDE 276 -- Post Hole Forms

Folder 34: ANDE 276 -- Radiocarbon Assay Reports
Folder 35: ANDE 276 -- Miscellaneous Work Notes
Folder 36: ANDE 276 -- Catalog Worksheets/Analysis Forms
Folder 37: ANDE 322 -- General Correspondence
Folder 38: ANDE 322 -- Research Design

Box 4

Folder 39: ANDE 322 -- Final Report
Folder 40: ANDE 322 -- Field Specimen Provenience Form
Folder 41: ANDE 322 -- Photographic Log
Folder 42: ANDE 322 -- Field Journal Notes (Horvath)
Folder 43: ANDE 322 -- Transit Information Forms
Folder 44: ANDE 322 -- Excavation Unit Forms
Folder 45: ANDE 322 -- Artifact Inventory Forms
Folder 46: ANDE 322 -- Artifacts by Field Specimen Numbers
Folder 47: ANDE 322 -- Conservation Information/Artifact Processing Record
Folder 48: ANDE 355 -- Research Design
Folder 49: ANDE 355 -- Final Report
Folder 50: ANDE 355 -- Photo Logs
Folder 51: ANDE 355 -- Field Forms

Box 5

Folder 52: ANDE 378 -- General Artifact Inventory Phase I
Folder 53: ANDE 378 -- General Artifact Inventory Phase II
Folder 54: ANDE 378 -- Ceramic Analysis Forms
Folder 55: ANDE 378 -- CAT Worksheets/Analysis Forms
Folder 56: ANDE 379 -- Trip Reports
Folder 57: ANDE 379 -- Field Specimen Log
Folder 58: ANDE 379 -- Photo Log
Folder 59: ANDE 379 -- Field Notes (Faust)
Folder 60: ANDE 379 -- Field Notebook (Horvath)
Folder 61: ANDE 379 -- Site Plan
Folder 62: ANDE 379 -- Analysis Worksheets
Folder 63: ANDE 379 -- Catalog Worksheets

Box 6

Folder 64: ANDE 379 -- General Artifact Inventory Forms
Folder 65: ANDE 379 -- Proofing Sheets
Folder 66: ANDE 409 -- Correspondence
Folder 67: ANDE 409 -- Trip Report (Cornelison)
Folder 68: ANDE 409 -- Research Design (Cornelison)
Folder 69: ANDE 409 -- Field Specimen Log
Folder 70: ANDE 409 -- Journal Recording Notes/Photo Log

Folder 71: ANDE 409 -- Feature Forms
Folder 72: ANDE 409 -- Artifact Analysis Forms
Folder 73: ANDE 429 -- Trip Report
Folder 74: ANDE 430 -- Correspondence
Folder 75: ANDE 430 -- 106 Compliance
Folder 76: ANDE 430 -- Research Design/Scope of Project

Box 7

Folder 77: ANDE 430 -- Project Proposal
Folder 78: ANDE 430 -- Criteria
Folder 79: ANDE 430 -- Progress Reports
Folder 80: ANDE 430 -- Research/Rough Draft for Final Report
Folder 81: ANDE 430 -- Final Report
Folder 82: ANDE 430 -- Contracts and Correspondence
Folder 83: ANDE 430 -- Bound Field Notes
Folder 84: ANDE 430 -- Loose Recording Notes/Field Journal
Folder 85: ANDE 430 -- Loose Feature Notes and Forms
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Folder 87: ANDE 430 -- Stratigraphic Profile (North Gate Feature)
Folder 88: ANDE 430 -- Illustrations

Box 8

Folder 89: ANDE 430 -- Artifact Inventory
Folder 90: ANDE 430 -- Artifact Cards
Folder 91: ANDE 431 -- Report
Folder 92: ANDE 432 -- Correspondence
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Folder 94: ANDE 432 -- Loose Journal Recording Notes
Folder 95: ANDE 432 -- Burial Notes
Folder 96: ANDE 433 -- Correspondence
Folder 97: ANDE 433 -- Final Report
Folder 98: ANDE 433 -- Photographic Log
Folder 99: ANDE 433 -- Field Notes
Folder 100: ANDE 434 -- Correspondence

Box 9

Folder 101: ANDE 435 -- Antiquities Act Permit and Related Correspondence
Folder 102: ANDE 435 -- General Correspondence
Folder 103: ANDE 435 -- Trip Report
Folder 104: ANDE 435 -- Research Design-Planning
Folder 105: ANDE 435 -- Journal Recording Notes
Folder 106: ANDE 435 -- Shovel/Posthole Test Forms
Folder 107: ANDE 435 -- Analytical Notes/Posthole Tests

Folder 108: ANDE 436 -- General Correspondence
Folder 109: ANDE 436 -- Trip Report
Folder 110: ANDE 436 -- Research Design-Planning
Folder 111: ANDE 436 -- Publication Plates

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Folder 112: ANDE 436 -- Journal Recording Notes
Folder 113: ANDE 436 -- General Artifact Inventory Form
Folder 114: ANDE 481 -- General Correspondence
Folder 115: ANDE 481 -- Trip Report
Folders 116-17: ANDE 481 -- Research Design
Folder 118: ANDE 481 -- State Site Form
Folder 119: ANDE 481 -- Field Specimen Log
Folder 120: ANDE 481 -- Journal Recording Notes
Folder 121: ANDE 481 -- Artifact Analysis Form
Folder 122: ANDE 542 -- Section 106 Compliance
Folder 124: ANDE 542 -- Trip Report

Box 11

Folder 125: ANDE 542 -- Research Design
Folder 126: ANDE 542 -- Field Specimen Log
Folder 127: ANDE 542 -- Photo Log
Folder 128: ANDE 542 -- Journal Recording Notes
Folder 129: ANDE 542 -- Shovel Test Forms
Folder 130: ANDE 542 -- Plan Maps
Folder 131: ANDE 542 -- Analysis Forms

Box 12

SERIES II: STILL PICTURES

Negatives, ANDE 62 to ANDE 378

Box 13

Negatives, ANDE 379 to ANDE 542

Box 14

Prints, ANDE 62 to ANDE 322

Box 15

Prints, ANDE 355 to ANDE 430

Box 16
Prints, ANDE 433 to ANDE 481

Box 17
Slides, ANDE 322 to ANDE 409

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Slides, ANDE 430

Drawer A
SERIES III: MAPS

ANDE 62 to ANDE 322

Drawer B
ANDE 355 to ANDE 430

Drawer C
ANDE 432 to ANDE 435

THE FREEDOM OF INFORMATION ACT

5 U.S.C. § 552

As Amended in 2002

§ 552. Public information; agency rules, opinions, orders, records, and proceedings

(a) Each agency shall make available to the public information as follows:

(1) Each agency shall separately state and currently publish in the Federal Register for the guidance of the public--

(A) descriptions of its central and field organization and the established places at which, the employees (and in the case of a uniformed service, the members) from whom, and the methods whereby, the public may obtain information, make submittals or requests, or obtain decisions;

(B) statements of the general course and method by which its functions are channeled and determined, including the nature and requirements of all formal and informal procedures available;

(C) rules of procedure, descriptions of forms available or the places at which forms may be obtained, and instructions as to the scope and contents of all papers, reports, or examinations;

(D) substantive rules of general applicability adopted as authorized by law, and statements of general policy or interpretations of general applicability formulated and adopted by the agency; and

(E) each amendment, revision, or repeal of the foregoing

Except to the extent that a person has actual and timely notice of the terms thereof, a person may not in any manner be required to resort to, or be adversely affected by, a matter required to be published in the Federal Register and not so published. For the purpose of this paragraph, matter reasonably available to the class of persons affected thereby is deemed published in the Federal Register when incorporated by reference therein with the approval of the Director of the Federal Register.

(2) Each agency, in accordance with published rules, shall make available for public inspection and copying--

(A) final opinions, including concurring and dissenting opinions, as well as orders, made in the adjudication of cases;

(B) those statements of policy and interpretations which have been adopted by the agency and are not published in the Federal Register;

(C) administrative staff manuals and instructions to staff that affect a member of the public;

(D) copies of all records, regardless of form or format, which have been released to any person under paragraph (3) and which, because of the nature of their subject matter, the agency determines have become or are likely to become the subject of subsequent requests for substantially the same records; and

Figure D.7 Freedom of Information Act

unless the materials are promptly published and copies offered for sale. For records created on or after November 1, 1996, within one year after such date, each agency shall make such records available, including by computer telecommunications or, if computer telecommunications means have not been established by the agency, by other electronic means. To the extent required to prevent a clearly unwarranted invasion of personal privacy, an agency may delete identifying details when it makes available or publishes an opinion, statement of policy, interpretation, staff manual, instruction, or copies of records referred to in subparagraph (D). However, in each case the justification for the deletion shall be explained fully in writing, and the extent of such deletion shall be indicated on the portion of the record which is made available or published, unless including that indication would harm an interest protected by the exemption in subsection (b) under which the deletion is made. If technically feasible, the extent of the deletion shall be indicated at the place in the record where the deletion was made. Each agency shall also maintain and make available for public inspection and copying current indexes providing identifying information for the public as to any matter issued, adopted, or promulgated after July 4, 1967, and required by this paragraph to be made available or published. Each agency shall promptly publish, quarterly or more frequently, and distribute (by sale or otherwise) copies of each index or supplements thereto unless it determines by order published in the Federal Register that the publication would be unnecessary and impracticable, in which case the agency shall nonetheless provide copies of an index on request at a cost not to exceed the direct cost of duplication. Each agency shall make the index referred to in subparagraph (E) available by computer telecommunications by December 31, 1999. A final order, opinion, statement of policy, interpretation, or staff manual or instruction that affects a member of the public may be relied on, used, or cited as precedent by an agency against a party other than an agency only if--

- (i) it has been indexed and either made available or published as provided by this paragraph; or
- (ii) the party has actual and timely notice of the terms thereof.

(3)(A) Except with respect to the records made available under paragraphs (1) and (2) of this subsection, and except as provided in subparagraph (E), each agency, upon any request for records which (i) reasonably describes such records and (ii) is made in accordance with published rules stating the time, place, fees (if any), and procedures to be followed, shall make the records promptly available to any person.

(B) In making any record available to a person under this paragraph, an agency shall provide the record in any form or format requested by the person if the record is readily reproducible by the agency in that form or format. Each agency shall make reasonable efforts to maintain its records in forms or formats that are reproducible for purposes of this section.

(C) In responding under this paragraph to a request for records, an agency shall make reasonable efforts to search for the records in electronic form or format, except when such efforts would significantly interfere with the operation of the agency's automated information system.

(D) For purposes of this paragraph, the term "search" means to review, manually or by automated means, agency records for the purpose of locating those records which are responsive to a request.

(E) An agency, or part of an agency, that is an element of the intelligence community (as that term is defined in section 3(4) of the National Security Act of 1947 (50 U.S.C. 401a(4))) shall not make any record available under this paragraph to--

Figure D.7 continued

(i) any government entity, other than a State, territory, commonwealth, or district of the United States, or any subdivision thereof; or

(ii) a representative of a government entity described in clause (i).

(4)(A)(i) In order to carry out the provisions of this section, each agency shall promulgate regulations, pursuant to notice and receipt of public comment, specifying the schedule of fees applicable to the processing of requests under this section and establishing procedures and guidelines for determining when such fees should be waived or reduced. Such schedule shall conform to the guidelines which shall be promulgated, pursuant to notice and receipt of public comment, by the Director of the Office of Management and Budget and which shall provide for a uniform schedule of fees for all agencies.

(ii) Such agency regulations shall provide that--

(I) fees shall be limited to reasonable standard charges for document search, duplication, and review, when records are requested for commercial use;

(II) fees shall be limited to reasonable standard charges for document duplication when records are not sought for commercial use and the request is made by an educational or noncommercial scientific institution, whose purpose is scholarly or scientific research; or a representative of the news media; and

(III) for any request not described in (I) or (II), fees shall be limited to reasonable standard charges for document search and duplication.

(iii) Documents shall be furnished without any charge or at a charge reduced below the fees established under clause (ii) if disclosure of the information is in the public interest because it is likely to contribute significantly to public understanding of the operations or activities of the government and is not primarily in the commercial interest of the requester.

(iv) Fee schedules shall provide for the recovery of only the direct costs of search, duplication, or review. Review costs shall include only the direct costs incurred during the initial examination of a document for the purposes of determining whether the documents must be disclosed under this section and for the purposes of withholding any portions exempt from disclosure under this section. Review costs may not include any costs incurred in resolving issues of law or policy that may be raised in the course of processing a request under this section. No fee may be charged by any agency under this section--

(I) if the costs of routine collection and processing of the fee are likely to equal or exceed the amount of the fee; or

(II) for any request described in clause (ii)(II) or (III) of this subparagraph for the first two hours of search time or for the first one hundred pages of duplication.

(v) No agency may require advance payment of any fee unless the requester has previously failed to pay fees in a timely fashion, or the agency has determined that the fee will exceed \$250.

(vi) Nothing in this subparagraph shall supersede fees chargeable under a statute specifically providing for setting the level of fees for particular types of records.

Figure D.7 continued

- (vii) In any action by a requester regarding the waiver of fees under this section, the court shall determine the matter de novo, provided that the court's review of the matter shall be limited to the record before the agency.
- (B) On complaint, the district court of the United States in the district in which the complainant resides, or has his principal place of business, or in which the agency records are situated, or in the District of Columbia, has jurisdiction to enjoin the agency from withholding agency records and to order the production of any agency records improperly withheld from the complainant. In such a case the court shall determine the matter de novo, and may examine the contents of such agency records in camera to determine whether such records or any part thereof shall be withheld under any of the exemptions set forth in subsection (b) of this section, and the burden is on the agency to sustain its action. In addition to any other matters to which a court accords substantial weight, a court shall accord substantial weight to an affidavit of an agency concerning the agency's determination as to technical feasibility under paragraph (2)(C) and subsection (b) and reproducibility under paragraph (3)(B).
- (C) Notwithstanding any other provision of law, the defendant shall serve an answer or otherwise plead to any complaint made under this subsection within thirty days after service upon the defendant of the pleading in which such complaint is made, unless the court otherwise directs for good cause is shown.
- (D) Repealed by Pub. L. 98-620, Title IV, 402(2), Nov. 8, 1984, 98 Stat. 3335, 3357.
- (E) The court may assess against the United States reasonable attorney fees and other litigation costs reasonably incurred in any case under this section in which the complainant has substantially prevailed.
- (F) Whenever the court orders the production of any agency records improperly withheld from the complainant and assesses against the United States reasonable attorney fees and other litigation costs, and the court additionally issues a written finding that the circumstances surrounding the withholding raise questions whether agency personnel acted arbitrarily or capriciously with respect to the withholding, the Special Counsel shall promptly initiate a proceeding to determine whether disciplinary action is warranted against the officer or employee who was primarily responsible for the withholding. The Special Counsel, after investigation and consideration of the evidence submitted, shall submit his findings and recommendations to the administrative authority of the agency concerned and shall send copies of the findings and recommendations to the officer or employee or his representative. The administrative authority shall take the corrective action that the Special Counsel recommends.
- (G) In the event of noncompliance with the order of the court, the district court may punish for contempt the responsible employee, and in the case of a uniformed service, the responsible member.
- (5) Each agency having more than one member shall maintain and make available for public inspection a record of the final votes of each member in every agency proceeding.
- (6)(A) Each agency, upon any request for records made under paragraph (1), (2), or (3) of this subsection, shall--

Figure D.7 continued

(i) determine within twenty days (excepting Saturdays, Sundays, and legal public holidays) after the receipt of any such request whether to comply with such request and shall immediately notify the person making such request of such determination and the reasons therefor, and of the right of such person to appeal to the head of the agency any adverse determination; and

(ii) make a determination with respect to any appeal within twenty days (excepting Saturdays, Sundays, and legal public holidays) after the receipt of such appeal. If on appeal the denial of the request for records is in whole or in part upheld, the agency shall notify the person making such request of the provisions for judicial review of that determination under paragraph (4) of this subsection.

(B)(i) In unusual circumstances as specified in this subparagraph, the time limits prescribed in either clause (i) or clause (ii) of subparagraph (A) may be extended by written notice to the person making such request setting forth the unusual circumstances for such extension and the date on which a determination is expected to be dispatched. No such notice shall specify a date that would result in an extension for more than ten working days, except as provided in clause (ii) of this subparagraph.

(ii) With respect to a request for which a written notice under clause (i) extends the time limits prescribed under clause (i) of subparagraph (A), the agency shall notify the person making the request if the request cannot be processed within the time limit specified in that clause and shall provide the person an opportunity to limit the scope of the request so that it may be processed within that time limit or an opportunity to arrange with the agency an alternative time frame for processing the request or a modified request. Refusal by the person to reasonably modify the request or arrange such an alternative time frame shall be considered as a factor in determining whether exceptional circumstances exist for purposes of subparagraph (C).

(iii) As used in this subparagraph, "unusual circumstances" means, but only to the extent reasonably necessary to the proper processing of the particular requests--

(I) the need to search for and collect the requested records from field facilities or other establishments that are separate from the office processing the request;

(II) the need to search for, collect, and appropriately examine a voluminous amount of separate and distinct records which are demanded in a single request; or

(III) the need for consultation, which shall be conducted with all practicable speed, with another agency having a substantial interest in the determination of the request or among two or more components of the agency having substantial subject matter interest therein.

(iv) Each agency may promulgate regulations, pursuant to notice and receipt of public comment, providing for the aggregation of certain requests by the same requestor, or by a group of requestors acting in concert, if the agency reasonably believes that such requests actually constitute a single request, which would otherwise satisfy the unusual circumstances specified in this subparagraph, and the requests involve clearly related matters. Multiple requests involving unrelated matters shall not be aggregated.

Figure D.7 continued

- (C)(i) Any person making a request to any agency for records under paragraph (1), (2), or (3) of this subsection shall be deemed to have exhausted his administrative remedies with respect to such request if the agency fails to comply with the applicable time limit provisions of this paragraph. If the Government can show exceptional circumstances exist and that the agency is exercising due diligence in responding to the request, the court may retain jurisdiction and allow the agency additional time to complete its review of the records. Upon any determination by an agency to comply with a request for records, the records shall be made promptly available to such person making such request. Any notification of denial of any request for records under this subsection shall set forth the names and titles or positions of each person responsible for the denial of such request.
- (ii) For purposes of this subparagraph, the term "exceptional circumstances" does not include a delay that results from a predictable agency workload of requests under this section, unless the agency demonstrates reasonable progress in reducing its backlog of pending requests.
- (iii) Refusal by a person to reasonably modify the scope of a request or arrange an alternative time frame for processing the request (or a modified request) under clause (ii) after being given an opportunity to do so by the agency to whom the person made the request shall be considered as a factor in determining whether exceptional circumstances exist for purposes of this subparagraph.
- (D)(i) Each agency may promulgate regulations, pursuant to notice and receipt of public comment, providing for multitrack processing of requests for records based on the amount of work or time (or both) involved in processing requests.
- (ii) Regulations under this subparagraph may provide a person making a request that does not qualify for the fastest multitrack processing an opportunity to limit the scope of the request in order to qualify for faster processing.
- (iii) This subparagraph shall not be considered to affect the requirement under subparagraph (C) to exercise due diligence.
- (E)(i) Each agency shall promulgate regulations, pursuant to notice and receipt of public comment, providing for expedited processing of requests for records—
- (I) in cases in which the person requesting the records demonstrates a compelling need; and
- (II) in other cases determined by the agency.
- (ii) Notwithstanding clause (i), regulations under this subparagraph must ensure--
- (I) that a determination of whether to provide expedited processing shall be made, and notice of the determination shall be provided to the person making the request, within 10 days after the date of the request; and
- (II) expeditious consideration of administrative appeals of such determinations of whether to provide expedited processing.
- (iii) An agency shall process as soon as practicable any request for records to which the agency has granted expedited processing under this subparagraph. Agency action to deny or affirm denial of a request for expedited processing pursuant to this subparagraph, and failure by an agency to respond in a timely manner to such a request shall be subject to judicial review under paragraph (4), except that the judicial review shall be based on the record before the agency at the time of the determination.

Figure D.7 continued

(iv) A district court of the United States shall not have jurisdiction to review an agency denial of expedited processing of a request for records after the agency has provided a complete response to the request.

(v) For purposes of this subparagraph, the term "compelling need" means--

(I) that a failure to obtain requested records on an expedited basis under this paragraph could reasonably be expected to pose an imminent threat to the life or physical safety of an individual; or

(II) with respect to a request made by a person primarily engaged in disseminating information, urgency to inform the public concerning actual or alleged Federal Government activity.

(vi) A demonstration of a compelling need by a person making a request for expedited processing shall be made by a statement certified by such person to be true and correct to the best of such person's knowledge and belief.

(F) In denying a request for records, in whole or in part, an agency shall make a reasonable effort to estimate the volume of any requested matter the provision of which is denied, and shall provide any such estimate to the person making the request, unless providing such estimate would harm an interest protected by the exemption in subsection (b) pursuant to which the denial is made.

(b) This section does not apply to matters that are--

(1)(A) specifically authorized under criteria established by an Executive order to be kept secret in the interest of national defense or foreign policy and (B) are in fact properly classified pursuant to such Executive order;

(2) related solely to the internal personnel rules and practices of an agency;

(3) specifically exempted from disclosure by statute (other than section 552b of this title), provided that such statute (A) requires that the matters be withheld from the public in such a manner as to leave no discretion on the issue, or (B) establishes particular criteria for withholding or refers to particular types of matters to be withheld;

(4) trade secrets and commercial or financial information obtained from a person and privileged or confidential;

(5) inter-agency or intra-agency memorandums or letters which would not be available by law to a party other than an agency in litigation with the agency;

(6) personnel and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of personal privacy;

Figure D.7 continued

- (7) records or information compiled for law enforcement purposes, but only to the extent that the production of such law enforcement records or information (A) could reasonably be expected to interfere with enforcement proceedings, (B) would deprive a person of a right to a fair trial or an impartial adjudication, (C) could reasonably be expected to constitute an unwarranted invasion of personal privacy, (D) could reasonably be expected to disclose the identity of a confidential source, including a State, local, or foreign agency or authority or any private institution which furnished information on a confidential basis, and, in the case of a record or information compiled by a criminal law enforcement authority in the course of a criminal investigation or by an agency conducting a lawful national security intelligence investigation, information furnished by a confidential source, (E) would disclose techniques and procedures for law enforcement investigations or prosecutions, or would disclose guidelines for law enforcement investigations or prosecutions if such disclosure could reasonably be expected to risk circumvention of the law, or (F) could reasonably be expected to endanger the life or physical safety of any individual;
- (8) contained in or related to examination, operating, or condition reports prepared by, on behalf of, or for the use of an agency responsible for the regulation or supervision of financial institutions; or
- (9) geological and geophysical information and data, including maps, concerning wells.

Any reasonably segregable portion of a record shall be provided to any person requesting such record after deletion of the portions which are exempt under this subsection. The amount of information deleted shall be indicated on the released portion of the record, unless including that indication would harm an interest protected by the exemption in this subsection under which the deletion is made. If technically feasible, the amount of the information deleted shall be indicated at the place in the record where such deletion is made.

- (c)(1) Whenever a request is made which involves access to records described in subsection (b)(7)(A) and--
- (A) the investigation or proceeding involves a possible violation of criminal law; and
- (B) there is reason to believe that (i) the subject of the investigation or proceeding is not aware of its pendency, and (ii) disclosure of the existence of the records could reasonably be expected to interfere with enforcement proceedings, the agency may, during only such time as that circumstance continues, treat the records as not subject to the requirements of this section.
- (2) Whenever informant records maintained by a criminal law enforcement agency under an informant's name or personal identifier are requested by a third party according to the informant's name or personal identifier, the agency may treat the records as not subject to the requirements of this section unless the informant's status as an informant has been officially confirmed.
- (3) Whenever a request is made which involves access to records maintained by the Federal Bureau of Investigation pertaining to foreign intelligence or counterintelligence, or international terrorism, and the existence of the records is classified information as provided in subsection (b)(1), the Bureau may, as long as the existence of the records remains classified information, treat the records as not subject to the requirements of this section.
- (d) This section does not authorize the withholding of information or limit the availability of records to the public, except as specifically stated in this section. This section is not authority to withhold information from Congress.

Figure D. 7 continued

(e)(1) On or before February 1 of each year, each agency shall submit to the Attorney General of the United States a report which shall cover the preceding fiscal year and which shall include--

(A) the number of determinations made by the agency not to comply with requests for records made to such agency under subsection (a) and the reasons for each such determination;

(B)(i) the number of appeals made by persons under subsection (a)(6), the result of such appeals, and the reason for the action upon each appeal that results in a denial of information; and

(ii) a complete list of all statutes that the agency relies upon to authorize the agency to withhold information under subsection (b)(3), a description of whether a court has upheld the decision of the agency to withhold information under each such statute, and a concise description of the scope of any information withheld;

(C) the number of requests for records pending before the agency as of September 30 of the preceding year, and the median number of days that such requests had been pending before the agency as of that date;

(D) the number of requests for records received by the agency and the number of requests which the agency processed;

(E) the median number of days taken by the agency to process different types of requests;

(F) the total amount of fees collected by the agency for processing requests; and

(G) the number of full-time staff of the agency devoted to processing requests for records under this section, and the total amount expended by the agency for processing such requests.

(2) Each agency shall make each such report available to the public including by computer telecommunications, or if computer telecommunications means have not been established by the agency, by other electronic means.

(3) The Attorney General of the United States shall make each report which has been made available by electronic means available at a single electronic access point. The Attorney General of the United States shall notify the Chairman and ranking minority member of the Committee on Government Reform and Oversight of the House of Representatives and the Chairman and ranking minority member of the Committees on Governmental Affairs and the Judiciary of the Senate, no later than April 1 of the year in which each such report is issued, that such reports are available by electronic means.

(4) The Attorney General of the United States, in consultation with the Director of the Office of Management and Budget, shall develop reporting and performance guidelines in connection with reports required by this subsection by October 1, 1997, and may establish additional requirements for such reports as the Attorney General determines may be useful.

Figure D.7 continued

(5) The Attorney General of the United States shall submit an annual report on or before April 1 of each calendar year which shall include for the prior calendar year a listing of the number of cases arising under this section, the exemption involved in each case, the disposition of such case, and the cost, fees, and penalties assessed under subparagraphs (E), (F), and (G) of subsection (a)(4). Such report shall also include a description of the efforts undertaken by the Department of Justice to encourage agency compliance with this section.

(f) For purposes of this section, the term--

(1) "agency" as defined in section 551(1) of this title includes any executive department, military department, Government corporation, Government controlled corporation, or other establishment in the executive branch of the Government (including the Executive Office of the President), or any independent regulatory agency; and

(2) "record" and any other term used in this section in reference to information includes any information that would be an agency record subject to the requirements of this section when maintained by an agency in any format, including an electronic format.

(g) The head of each agency shall prepare and make publicly available upon request, reference material or a guide for requesting records or information from the agency, subject to the exemptions in subsection (b), including--

(1) an index of all major information systems of the agency;

(2) a description of major information and record locator systems maintained by the agency; and

(3) a handbook for obtaining various types and categories of public information from the agency pursuant to chapter 35 of title 44, and under this section.

Go to: DOJ FOIA Page // Justice Department Home Page

Last Updated December 23, 2002
usdoj/jmd/lis/caf

Figure D.7 continued

Researcher Registration Form

Name: _____	Date: _____
Picture ID card type, State Control Number: _____	
Institutional affiliation: _____	
Work address: _____ _____	
Phone: _____ FAX: _____ E-Mail: _____	
Home address: _____ _____	
Phone: _____ FAX: _____ E-Mail: _____	
Contacted Park through: Visit <input type="checkbox"/> Letter <input type="checkbox"/> Phone call <input type="checkbox"/> FAX <input type="checkbox"/> E-mail <input type="checkbox"/> FOIA <input type="checkbox"/> Subpoena <input type="checkbox"/>	
Research project summary: _____ _____ _____	
Publication plans (publisher, type of publication and date): _____ _____ _____	
Researcher Duplication Form Numbers: _____	
Other special requirements: _____	
Collections used (Name and box number; Use reverse): _____	

Figure D.8 Researcher Registration Form

Copyright and Privacy Restrictions

The copyright law of the United States (Title 17, *United States Code*) governs the making of photocopies or other reproductions of copyrighted materials. The various state privacy acts govern the use of materials that document private individuals, groups, and corporations.

Under certain conditions specified in the law, libraries and archives are authorized to furnish a reproduction if the document does not infringe the privacy rights of an individual, group, or corporation. These specified conditions of authorized use include:

- non-commercial and non-profit study, scholarship, or research, or teaching
- criticism, commentary, or news reporting
- as a NPS preservation or security copy
- as a research copy for deposit in another institution

If I, the researcher, later use a copy or reproduction for purposes in excess of "fair use," I, the researcher, am personally liable for copyright, privacy, or publicity infringement and agrees to indemnify the NPS from any legal action as a result of the error. The [Park's] permission to obtain a photographic, xerographic, digital, or other copy of a document **doesn't** indicate permission to publish, exhibit, perform, reproduce, sell, distribute, or prepare derivative works from this document without first obtaining permission from the copyright holder and from any private individual, group, or corporation shown or otherwise recorded.

Permission to publish, exhibit, perform, reproduce, prepare derivative works from, sell, or otherwise distribute the item must be obtained by the researcher separately in writing from the holder of the original copyright (or if the creator is dead from his/her heirs) as well as from any individual(s), groups, or corporations whose name, image, recorded words, or private information (e.g., employment information) may be reproduced in the source material. The holder of the original copyright **isn't** necessarily the National Park Service. The National Park Service is not legally liable for copyright, privacy, or publicity infringement when materials are wrongfully used after being provided to researchers for "fair use."

This institution reserves the right to refuse to accept a copying order if fulfillment of the order is judged in violation of copyright or federal or state privacy or publicity law. This institution also places restrictions on the use of cameras, photocopiers, and scanners in the research room.

I, the researcher, understand and agree to the above terms and will indemnify, defend, save, and hold the National Park Service harmless from all claims, demands, losses, or damages (including attorney's fees and expenses) arising out of any legal action, settlement, or adjustment resulting from my not having followed the guidelines provided above.

Printed Name

Signature

Date

Figure D.9 Copyright and Privacy Restrictions

Access Policies and Rules Governing Use

[Name of Park]

Availability

Researchers are encouraged to complete their preliminary research at archives and libraries with a broader topical focus before approaching the holdings of the [Park]. NPS has limited reference staff and research resources that must be made available to researchers whose work focuses on materials available only at the [Park]. Access to materials is dependent upon their physical condition and the level of processing to-date by the NPS. All research must be done on-site in the research room.

Access

- Researchers should submit a written request to the curatorial office, detailing their research project to the curatorial staff.
- Requests for materials should be submitted with enough lead time to allow for the evaluation of the request and the scheduling of curatorial staff to oversee the research.
- All research requests should be addressed to:
Curatorial Office, [Park], [Street Address]
- Approval of all requests will be based on availability of curatorial staff to supervise researchers.
- The curatorial staff at [Park] requests that the researcher read the abstracts in the archival guide or finding aids before requesting to view any collection of documents.
- To ensure the conservation and security of this resource, browsing is not permitted.

Citations

- When crediting the park, list "National Park Service"; the full park name; collection title; the catalog, box, folder, and image numbers; and credit the creator of the item (e.g., photographer).

Reading Room Rules

- Only lead pencils, not pens or markers, may be used for note taking.
- Scanners, portable photocopy machines, and cameras (including digital cameras) are prohibited to avoid damage to materials and copyright infringement.
- Use of tape recorders, typewriters, and portable computers is subject to security procedures.
Use of any equipment must not bother other researchers.
- No food, beverages, or smoking will be allowed in the reading room area.
- No coats, packages, containers, folders, cases (including briefcases), or bags (including handbags larger than wallets) are permitted in the reading room area.
- Copying is available within reasonable limits at 25 cents per page.
- The reading room will close if no supervisory staff is available.
- Researchers must maintain quiet in the reading room.
- Researchers register annually and must sign in and out each time they enter or leave.

Figure D.10 Access Policies and Rules Governing Use (Sample)

Access Policies and Rules Governing Use [Name of Park]

Reading Room Rules (continued)

- Researchers may not remove any archival or manuscript materials from the reading room.
- Researchers may work with archival or manuscript materials only in the reading room, not in museum storage or staff work spaces.
- Researchers must submit prepaid written requests for copies or duplicates.
- Researchers must submit for inspection all materials carried into and out of the reading room
- The park reserves the right to limit access to fragile or restricted collections.
- The park archives is not a lending library. All materials must be used in the reading room
- Researchers will work with only one document from one folder from one box of materials at a time to avoid damaging a collection's original order.
- Researchers who disregard these rules or endanger the records or the work of others will be denied access.

Permission to obtain a copy for scholarly purposes does not constitute permission to publish

[See Copyright and Privacy Restrictions Statement.]

Handling

- When handling the archival and manuscript materials, only one folder may be removed from a box at a time, and folders must be laid flat on the table.
- Documents should be handled with utmost care and viewed only one at a time
- Manuscripts and books may not be leaned on, written on, folded, traced over, or handled in any manner that may damage them.
- Researchers must maintain the original order of documents within their folders. Attending staff should be contacted if there is any sign of damage or if items appear to be out of order
- No attempt should be made to reorder or rearrange the documents or folders or to repair any physical damage.
- Cotton gloves must be used when handling photographic images.
- Only one box or volume of material will be issued at one time.
- Latex gloves must be worn when working with materials that may pose a health hazard

I understand the rules listed above and will abide by them.

Printed Name of Researcher

Signature of Researcher

Date

Figure D.10 continued

Researcher Duplication Form

Name: _____

ID type and number _____ Type/Amount of deposit _____

Affiliation _____ Date order was filled: _____ Who filled it: _____

Reason for copies: Publication Research Exhibit Product development
 Teaching Criticism Other (Describe): _____

Please describe any special duplication needs, such as blow-ups or rush job (extra cost):

I understand, that unless authorized elsewhere by Park staff in writing, that the copies provided here are for non-commercial and non-profit research, news reporting, criticism, and commentary purposes only. The provision of copies does not authorize me to publish, exhibit, distribute, sell, perform, reproduce, or prepare derivative works from the copies I receive. I indemnify the park from any legal liability resulting from my use of these copies.

Signature: _____ **Date:** _____

Figure D.11 Researcher Duplication Form

Appendix E: Scope of Collection Statement

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APPENDIX E: SCOPE OF COLLECTION STATEMENT

A. Overview

1. *What information will I find in this appendix?*

You will find a checklist that can be used to review a draft or approved Scope of Collection Statement (SOCS). You also will find a sample completed SOCS.
 2. *Who can assist me in writing or revising my park's Scope of Collection Statement?*

Contact your System Support Office (SSO) curator for examples of approved SOCS that show how different parks have written their statement. Figure E.1 includes, as an example, the approved Scope of Collection Statement for Mesa Verde National Park.
- Obtain a 3½" diskette from your SSO curator to assist you in writing or revising your SOCS. The disk contains the required format and language for a SOCS. You can use this disk to fill in the wording that is pertinent to your park.
- If you have questions about what types of collections to include in the Types of Collection Section, contact your park and SSO discipline specialists.

B. Evaluating Your Scope of Collection Statement

1. *How do I evaluate a Scope of Collection Statement?*

Use the checklist included in Figure E.2 to review a draft or approved SOCS.

See the NPS Museum Handbook, Part I (MH-I), Chapter 2, Scope of Museum Collections (1994), for guidance on writing a Scope of Collection Statement. Read this guidance before reviewing your SOCS.
2. *How do I use the checklist?*

To use the checklist:

- Enter the unit's complete name. A unit is a park, center, or office with a museum collection. Place an "X" in either the draft or approved block. Enter the date (month, day, and year) of draft or approved document. Enter the name of reviewer and date reviewed.
- Place a checkmark in the "YES" column to indicate that the required wording is in the SOCS, that the wording is accurate, and that it is in the appropriate section.
- Place a checkmark in the "NO" column to indicate that the required statement does not appear in the SOCS.
- Place an "X" in the "YES" column to indicate that there is a note explaining a partial deficiency either adjacent to the "X" response or in Section I of the checklist. Number each note included in Section I to correspond with the applicable checklist question.

- Place an N/A entered between the "YES" and "NO" columns to indicate that the question is not applicable to the SOCS.
- There may be times when the answer to a specific checklist question cannot be answered by the reviewer. If this is the case, print "ND" meaning "Not Determined" on the appropriate lines.

For certain statements, the specific reference for the *MH-I*, Chapter 2, Scope of Museum Collections (1994), is provided in brackets following the statement. For example, [MH-I,2:8-9] means NPS *Museum Handbook*, Part I, Chapter 2, Scope of Museum Collections, pages 8-9.

3. *Where do I find the checklist?*

See Figure E.2 for the checklist. An unpunched full size checklist accompanies this appendix. Keep the full size checklist as a master and make copies for your use.

C. List of Figures

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U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
MESA VERDE NATIONAL PARK

SCOPE OF COLLECTION STATEMENT

Prepared by: John W. Jackson 7/25/96
Park Curator Date

Recommended by: Jessica C. Price 7/25/96
Chief, Cultural Resource Management
Division Date

Approved by: Robert C. Miller 7/25/96
Park Superintendent Date

Figure E.1. Example Approved Scope of Collection Statement

SCOPE OF COLLECTION STATEMENT

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Figure E.1. Example Approved Scope of Collection Statement (continued)

I. INTRODUCTION

This Scope of Collection Statement defines the scope of present and future museum collection holdings of Mesa Verde National Park that contribute directly to the understanding and interpretation of the park's purpose, themes and resources, as well as those objects that the Service is legally mandated to preserve. It is designed to ensure that the museum collection is clearly relevant to the park.

The National Park Service's (NPS) legal mandate for acquiring and preserving museum collections is contained in the *Antiquities Act of 1906* (16 USC 431-433), the *Organic Act of 1916* (16 USC 1 et. seq.), the *Historic Sites Act of 1935* (16 USC 461-467), the *Management of Museum Properties Act of 1955* (16 USC 18f), the *Reservoir Salvage Act of 1960*, as amended (16 USC 469-469c); the *Archeological and Historical Preservation Act of 1974* (16 USC 469-469c); the *National Historic Preservation Act of 1966*, as amended (16 USC 470-470t, Sec. 110), and the *Archaeological Resources Protection Act of 1979* (16 USC 470aa-mm).

Mesa Verde is the only national park in the United States whose primary goal is cultural resource protection and preservation. The enabling legislation (34 Stat. 616) which established Mesa Verde National Park on June 29, 1906 states, in part, that the park was established for the

"...preservation from injury or spoliation of the ruins and other works and relics of prehistoric or primitive man..."

The primary mission is therefore the proper management and preservation of cultural resources for the inspiration, benefit, and edification of the public. It has, however, a secondary mission to properly manage and preserve the natural resources. The park's museum collection is integral to both interpretive and management needs related to these two missions.

Many artifacts were removed from the sites presently within park boundaries prior to the establishment of the park, and nearly all of the artifacts recovered during park site preservation projects and archeological excavations conducted before 1923 were placed in the Smithsonian Institution. Efforts to assemble a museum collection within the park began in 1917 when one room of a log cabin, built in 1916 as a ranger station, was converted into a museum by the superintendent. He recognized the need for exhibits of artifacts from the sites of Mesa Verde. National Park Service support for this museum project consisted of an appropriation of \$22.00 for the construction of an exhibit case. The log cabin museum that opened in 1918, was one of the first museums built and operated by the National Park Service. The old log cabin museum was a success and served the public until 1925. It was later dismantled and then reconstructed near the present picnic area on Chapin Mesa. Today it is one of the park's most important historic buildings.

In 1921, Superintendent Jesse L. Nusbaum began an effort to build a large archeological museum on Chapin Mesa to replace the log cabin museum. His requests for support were repeatedly turned down. He finally turned to private citizens for assistance. Donations from Mrs. Stella Leviston,

Figure E.1. Example Approved Scope of Collection Statement (continued)

of San Francisco, and from Mr. John D. Rockefeller, Jr., provided the financial support necessary to build the museum and purchase exhibit cases. The Mesa Verde Archeological Museum was opened to the public in 1925. A major addition completed in 1936, gave the building its present form. Today it houses an outstanding collection of archeological objects from the park and adjacent areas. It is an important part of the park interpretive program and is listed in the National Register of Historic Places.

The Far View Visitor Center, opened to the public in 1969, as a museum, exhibits ethnographic artifacts from Southwest Native American groups. The majority of the material on exhibit was acquired by a gift from Mary Jane Colter.

Constructed in 1958 as a laboratory for processing archeological collections, the Mesa Verde Research Center stores the museum collections which are not on exhibit or on loan to other institutions. The Research Center also serves as the repository for the museum collections from Hovenweep and Yucca House national monuments. Park staff modified the Research Center to establish an appropriate collection storage space. These modifications were completed in 1982.

Mesa Verde National Park has several planning documents that have a direct bearing on the park's scope of collections. One of these plans, the Interpretive Prospectus (approved March 1981), identifies the following themes:

1. The evolution of southwestern culture: the Mesa Verde Ancestral Pueblo, their neighbors, antecedents, and descendants
2. Early Euro-American explorers and settlers of the Mesa Verde
3. Historic and modern Southwestern Native American art forms and their relationship to Ancestral Pueblo material culture
4. The natural history of the Four Corners area

The park's approved Resource Management Plan (approved October 1983) states that the "park is divided into four land classification zones. Eighty-two percent of the park is represented in the Historical/Cultural zone. This is appropriate because of the large number of prehistoric sites and cliff dwellings found in the area and which caused the land to be set aside as a national park." It also states, "No less important than the ruins themselves are the materials they still contain and those which have been collected in the past during authorized archeological investigations." This collection, which numbers close to 1.5 million individual objects, has an immense research potential. The plan states:

Figure E.1. Example Approved Scope of Collection Statement (continued)

"Much of it has not yet been properly studied, and even those portions which have been studied continue to yield new information as new procedures evolve in the analytical techniques of archeological research. Many individual items from the collection are displayed in the park's archeological museum, but the vast majority are housed in the Research Center where they are available both for use in the interpretive displays and for scholarly research. While less obvious to the casual visitor, the prehistoric collection constitutes a major cultural resource."

Another portion of the Resource Management Plan states, "While the emphasis of the park is on cultural themes, specifically history and prehistory and to a lesser extent, ethnography, the natural history of the park has become a secondary theme, one which is essential not only to a full understanding of the park as a whole, but also to a better understanding of certain aspects of its history and prehistory. As a result, extensive collections in the natural sciences have been assembled since the creation of the park."

The park's approved Statement for Management (approved 1986) lists the following management objectives related to resource preservation:

1. To preserve, protect and interpret the park's cultural and natural resources.
2. To provide for visitor use, safety and enjoyment of Mesa Verde's cultural and natural resources.
3. To provide the opportunity for and encourage research by bona fide educational institutions and qualified individuals.

The approved Statement for Management also states that "the primary and most significant features of Mesa Verde National Park are archeological." It follows that the archeological portion of the museum collection is the most important. This is in fact the case. Mesa Verde National Park manages one of the largest archeological collections in any national park. Archeological materials, except inalienable and communal property, recovered from within park boundaries through systematic collection are National Park Service property and must be retained in the park's museum collection in accordance with *43 CFR 7.13* and *NPS Management Policies* (Dec 88). The approved Statement for Management, and the General Management Plan also address concerns that the park's archeological resources are managed as part of the park's overall museum collection.

36 CFR 2.5g states that specimen collection permits issued by the Superintendent must contain the following conditions: "(1) Specimens placed in displays or collections will bear official National Park Service museum labels and their catalog numbers will be registered in the National Park Service National Catalog; and (2) Specimens and data derived from consumed specimens must be made available to the public and reports and publications resulting from a research specimen collection permit shall be filed with the superintendent."

Figure E.1. Example Approved Scope of Collection Statement (continued)

Other laws, regulations, directives and conventions pertinent to the acquisition of museum collections include: the *Lacey Act of 1900* (18 USC 43-44); the *Bald Eagle Protection Act of 1940* (16 USC 668a-668d); the *Migratory Bird Treaty Act of 1918* (16 USC 703-711); the *Marine Mammal Protection Act of 1972* (16 USC 1361-1407); the *Endangered Species Act of 1973*, as amended (16 USC 1531-1543); the *American Indian Religious Freedom Act of 1978* (42 USC 1996); the *Native American Graves Protection and Repatriation Act of 1990* (NAGPRA) (25 USC 3001-3013); the *Federal Property and Administrative Services Act of 1949*, as amended (40 USC 483[b]); the *Federal Records Act of 1950*, as amended ("Records Management by Federal Agencies" [44 USC 3101 et. seq.]); Federal Property Management Regulations (FPMR), 41 CFR 101; 410 Departmental Manual, Interior Property Management Regulations (IPMR); 411 Departmental Manual, "Museum Property Management," Chapters 1-3; "Curation of Federally-Owned and Administered Archeological Collections," 36 CFR 79; NAGPRA Final Regulations, 43 CFR 10; "Disposition of Federal Records," 36 CFR 1228; Preservation, Arrangement, Duplication, Exhibition of Records (44 USC 2109); Disposal of Records (44 USC 3301 et seq.); NPS Special Directive 87-2, "Conservation of Archeological Resources"; NPS Special Directive 91-4, "Ensuring that Natural Resource Projects Fund the Curation of Collections"; NPS Special Directive 94-6, "Ensuring that Projects Generating Museum Collections Fund Cataloging and Basic Preservation"; the 1983 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and the 1970 UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property (implemented in the United States by P.L. 97-446 in 1983, 19 USC 2601).

The prehistoric cultural resources of Mesa Verde National Park have received international recognition. The park was designated a World Heritage Cultural Park on September 8, 1978. It was the first cultural area so designated in the United States.

II. TYPES OF COLLECTIONS

The park's scope of collection includes archeological artifacts (c. 500-1200 A.D.) related to Ancestral Pueblo sites in the park and associated records; ethnological objects such as Pueblo Indian ceramics, watercolors, Navajo jewelry and textiles, Apache and Pima basketry; historical objects and archival and manuscript collections related to early exploration and homesteading, early park development and operation, and the Civilian Conservation Corps; herbarium housing specimens of each species of vascular plant found within the park and associated records; and other natural history specimens and associated records.

The interpretive themes, resource management goals and objectives, and mandates stated in the Introduction Section serve as guidance for acquiring objects for the park's museum collection. The park's museum collection is divided into two major categories: the cultural collection and the natural history collection.

Figure E.1. Example Approved Scope of Collection Statement (continued)

A. Cultural Collection

The purposes of this collection are to preserve a portion of our nation's cultural heritage and to increase knowledge and inspiration among present and future generations through exhibits, research, and interpretive programs. The cultural collection is sub-divided into three disciplines: archeology, ethnology, and history. The following list identifies by discipline object types appropriate to the park's museum collection and notes the current representation of these types of collections.

1. Archeology

Archeological collections are generated in response to cultural resource management requirements related to legal mandates, to development of park facilities, to preservation-related activities, to research requirements, and to interpretive needs. The archeological collection includes artifacts, human remains, and other materials obtained using archeological methods.

Uncontrolled surface collecting by visitors and park staff is discouraged. Artifacts found on the surface by visitors should not be removed from their original location by the finder. They should be reported to park staff. If materials are turned in to park staff, appropriate measures must be taken to ensure that the visitor collects no more material, that precise provenience information is recorded, if possible, and that the objects/data are promptly turned in to the Mesa Verde Research Center upon receipt by staff members.

The bulk of the museum collection consists of archeological material that includes:

- a. **Ancestral Pueblo Material.** Mesa Verde National Park has historically been considered the type locality of the Mesa Verde Branch of the Anasazi (Ancestral Pueblo) culture. The materials excavated from archeological sites within the park have provided the baseline data used to describe the material culture of these people, and it is an extremely important systematic research collection. The known occupation of Mesa Verde National Park is about A.D. 500 through the 1200's. The Mesa Verde Ancestral Pueblo did not "just appear", live in total isolation from their neighbors, nor "disappear". Therefore, examples of material culture from archeological sites outside the park are included in the museum collection to adequately interpret and to better understand the cultural development of the Mesa Verde Ancestral Pueblo. This material will continue to be collected on a limited basis. The objects must be relevant to the park's interpretive themes and be of scientific importance.

The park interprets the development of culture from the Paleo-Indian culture through the Ancestral Pueblo occupation of the Mesa Verde. Material culture remains from the Paleo-Indian, and Basketmaker II periods have not been recovered within Mesa Verde

Figure E.1. Example Approved Scope of Collection Statement (continued)

National Park. Therefore, the park has generally relied on loans of this material from other institutions to interpret these time periods through museum exhibits. The recent return of some of these objects to their owners has created serious gaps in the Archeology Museum's exhibits.

- b. **Historic Material.** The collection contains material from sites related to the settlement of the lands within the park during the late 1800's; and associated with early park development, from 1906 through 1943. Materials from both Euro-American sites and Native American sites are included in this category. Only archeological materials dating to the historic period and directly related to the above are included in the museum collection.
- c. **Associated Records.** All records associated with archeological collections are retained as part of the museum collection. These records include field notes and catalogs; daily journals; drawings and maps; photographic negatives, prints and slides; sound recordings; raw data sheets; instrument charts; remote sensing materials; artifact inventories, analytical study data; conservation treatment records; computer documentation and data; reports generated by archeological investigations; as well as any other documents generated through archeological or preservation activities.
- d. **Confiscated Archeological Objects.** These are objects recovered from unauthorized and illegal activities. They might include unearthed artifacts, ecofacts, and human remains illegally excavated or uncontrolled surface collecting by unauthorized individuals within the park boundaries. The museum curator should be consulted as soon as possible to ensure proper handling and transportation of these materials. Such objects might be held temporarily as evidence if legal action is to be taken, but should be formally turned over to the museum curator as soon as possible. The museum curator will maintain all such objects, following standard "chain of evidence" procedures, in the Mesa Verde Research Center. Once all legal questions are resolved, the objects and all associated documentation will be added to the museum collection.

2. Ethnology

a. Objects

Acquired, mostly through gifts between 1920 and 1950, the ethnology collection presently includes examples of Native American material culture from the Southwest, the Great Basin, and adjacent culture areas. These artifacts illustrate the cultural continuity of the Native American cultures of the Southwest, as well as their cultural adaptation and change as seen through their material culture. They also illustrate Native American artistic traditions in the Southwest and provide examples of the arts and crafts of groups with whom Mesa Verde National Park has been associated.

Figure E.1. Example Approved Scope of Collection Statement (continued)

The collection consists primarily of Pueblo Indian ceramics, watercolors, and jewelry, and Navajo jewelry and textiles. There are also a few fine examples of Apache basketry, Pima basketry, and Ute beadwork. The majority of these objects are currently on exhibit, and the collection serves more of an interpretive function than a research function because of the limited number of types of objects represented.

The park has important ties to the Ute tribe, but the collection of Ute material culture items is inadequate. Nearly all of the ethnographic artifacts on exhibit that are attributed to the Ute Indians are on loan to Mesa Verde National Park. The return of these objects to their owners would virtually eliminate this part of the park's interpretation. If interpretation of Ute culture is to continue, the park must collect additional examples of Ute material culture.

While the park will continue to acquire ethnographic material from all Native American groups in the Southwest, emphasis will be placed on the material culture of those groups within the Ancestral Pueblo geographic area.

b. *Associated Records*

All records associated with ethnographic collections are retained as part of the museum collection. These records may include field notes; interview schedules, tapes (video and audio), interview transcripts; negatives, prints and slides; data sheets (all subject to restrictions of confidentiality, if any); artifact inventories, analytical study data; conservation treatment records; computer documentation and data; reports generated by ethnographic investigations; as well as any other documents generated through ethnographic field work.

3. *History*

Only historic material which has a direct association with the park is included in the museum collection. When a large quantity of an object type is available, priority is given to acquiring the best preserved examples. The history collection is based on the park's themes used to establish the following collecting categories:

- a. *Early Exploration and Homesteading (Pre-1906).* There are few objects directly associated with the early exploration and homesteading of the Mesa Verde area in the collection, and it is unlikely that much material of this type will become available. Known original field notes and photographs, such as those from the 1874 Hayden Survey, are now in the Smithsonian Institution. However, if original material of this nature becomes available, it should be collected.

Figure E.1. Example Approved Scope of Collection Statement (continued)

b. ***Early Park Development (1906-1932).*** Material in this category includes original correspondence between park staff and resource specialists (e.g., Dr. Jesse Walter Fewkes); photographs, blueprints, specifications and other items documenting facility development and resource preservation activities; building furnishings; and staff personal items (e.g., Superintendent Schumacher's badge, 1911-13). The park will continue to collect staff member's personal items that directly relate to park activities and non-official documentary material, other than park administrative records, related to this time period that does not duplicate the material already in its possession.

Park administrative records, including duplicate copies of superintendent's reports, chief naturalist's reports, photographic prints, negatives, and slides are managed as part of the museum history collection.

c. ***Civilian Conservation Corps (CCC, 1933-1942).*** The CCC period played an important role in the development of the park and in the preservation of park resources. Items in the museum collection from this period are: building furnishings, copies of administrative records, construction drawings, photographic documentation of projects, tools, art work (e.g., P.W.A. artwork, exhibition illustrations), and architectural features. If more material documenting CCC activities becomes available, it should be collected when it does not duplicate what is presently available. Areas where documentation is incomplete include camp life, identification of personnel in the photographic records on hand, and copies of camp publications (e.g., *Kiva Crier*).

Many of the park's administrative, maintenance, and residential buildings were either constructed or significantly modified during the CCC period, and are nominated to the National Register of Historic Places. Exceptions include mobile homes, the Research Center, modern buildings in the Far View area, and concessioner facilities in the campground. The museum collection should include representative samples of architectural fabric, documenting the original materials and workmanship of this period as it becomes available.

Some works of art, created as exhibition illustrations, have been included in the museum collection. Other important examples remain in the exhibits and these, along with some individual exhibits (e.g., dioramas) should become part of the museum collection.

d. ***Current Events.*** Memorabilia from important current or commemorative events are included in the museum collection. Materials from the park's 75th anniversary and the First World Conference on Cultural Parks, for example, have been included. Materials from these types of activities will continue to be preserved as they become available.

Figure E.1. Example Approved Scope of Collection Statement (continued)

- e. **Rare Books and Manuscripts.** A small number of library materials (e.g., rare books and manuscripts) are included in the museum collection. The park library contains other rare books (e.g., Nordenskiold's 1891 publication) which should also be included in the museum collection. Rare books and original manuscripts, having direct association with Mesa Verde National Park, will continue to be included in the museum collection.

Mesa Verde National Park's library includes a large number of books that are out of print, technical references, and administrative documents. This material, though valuable, will not be included in the museum collection and will continue to be managed under the park's library management plan. The library and printed matter in the museum collection both support the park's research, interpretive, and resource management programs.

In accordance with NPS-19, *Records Management Guideline*, the park library committee examines all current park files as they are disposed of to ensure retention of copies of non-official important materials in the park. Retained materials are managed as part of the museum collection. Policy and procedures for library collections are outlined in NPS *Management Policies* (Dec 88), Chapter 5; and Special Directive 94-1 (Feb 94), National Park Service (NPS) Library Program.

B. Natural History Collection

Collecting and maintaining a natural history collection, though of secondary importance to the cultural collection, is an important part of the management of the park's resources. The natural history collection exists to provide baseline data of park natural resources, to document changes these resources are undergoing because of internal park conditions and external effects, and to provide a database for researchers concerned with resource use by the park's prehistoric occupants.

The means by which the natural resource museum collection should grow is through authorized scholarly research, which is based on needs identified in this document and in the park's approved Resource Management Plan. This scholarly research may be conducted by park or non-park scientists. Collecting by park staff must be in compliance with the park's approved "Staff Field Collecting Procedures." The collecting of research specimens must comply with 36 CFR 2.5. All researchers must comply with applicable state and Federal laws regulating collecting, documenting collections, and other associated activities.

Three separate areas of the park, totalling 8,100 acres, were designated as wilderness in 1976. Park Mesa received designation as a "Research Natural Area" in 1966. All collecting of natural resource specimens that impacts these areas must take into consideration restrictions in effect because of these special designations.

Figure E.1. Example Approved Scope of Collection Statement (continued)

Natural resource specimens collected outside the park boundaries will not be included in the collection unless the specimens are required to illustrate interpretive exhibits, to augment specific park-related research projects or to demonstrate effects on park resources. Written permission from land owners or appropriate officials is obtained when collecting occurs on their land. This documentation must become part of the museum collection's accession file.

Taxidermy "mounts" and freeze dried specimens will be obtained only when a specific need (e.g., exhibit) is identified. Specialty collections such as frozen or other types of tissue samples are beyond the capability of the park to preserve. If they are collected and held by other repositories, they will be fully documented according to the applicable regulations. Archived soils and other strictly environmental monitoring samples will only be collected as part of authorized research projects.

This collection is divided into three disciplines: biology, geology, and paleontology. The following list identifies the categories of specimens which are to be included in the museum collection and notes their current representation.

1. *Biology*

- a. ***Flora.*** Each species of vascular plant growing in the park may be represented by a herbarium specimen, including fruit and flower, whenever possible. Additional specimens illustrating regional differences within the park as well as important variations in form, color, or hybrids, may also be included.

Major herbarium collections of vascular plants were made in the 1940's and 1960's. Thus, nearly all species are represented in the herbarium. The non-vascular flora are not well represented in the herbarium. One research project has been conducted in this area; a lichen study was conducted in 1981. Specimens from this project are in the Mesa Verde herbarium. Duplicate specimens are at the University of Arizona.

Three rare species of plants have been identified in Mesa Verde National Park. These are *Astragalus Schmollae*, C. L. Porter, *Astragalus deterior* (Barneby) Barneby, and *Hackelia gracilenta* (Johnston). Researchers must comply with all regulations governing these species.

- b. ***Mammals.*** Each species of non-endangered mammal occurring in the park should be represented by one good study skin and skull of an adult male, and an adult female. Immature individuals may be represented when found to show significant differences from adults. The collection may also include the minimum number of specimens needed to illustrate the range of morphological differences present in the species, to show seasonal and transitional stages of pelage, and to record local varieties. Additionally, complete skeletal remains, casts of tracks of fore and hind feet, and scats may be collected. The

Figure E.1. Example Approved Scope of Collection Statement (continued)

majority of the mammal specimens in the collection were collected in the 1930's. Not all species found in the park are represented.

A major research study of small mammals was conducted from 1989-1994. The study included the collection and preservation of small mammal species found in the park.

No known endangered, threatened, or rare species are known in the park.

- c. **Birds.** Each species of non-endangered bird occurring in the park, either as a migrant or resident, should be represented by one good study skin and skull of an adult male, and an adult female. Immature individuals may be represented when found to show significant differences from adults. The collection may also include the minimum number of specimens needed to illustrate the range of morphological differences present in the species, to show seasonal and transitional stages of plumage observed in the park, and to record local varieties. Additionally, complete skeletal remains, one nest of each species, the minimum number of eggs required to show variation, and pellets may be collected.

The majority of the bird specimens presently in the collection were collected in the 1930's. Not all species found in the park are represented.

Two threatened, endangered, or rare species have been recorded in the park. These are: *Haliaeetus leucocephalus* and *Falco peregrinus*. Researchers must comply with all regulations governing these species.

- d. **Reptiles and Amphibians.** Each species of non-endangered reptile and amphibian found in the park should be represented by one adult of each sex and a specimen of each distinctive developmental form. The collection may also include the minimum number of specimens needed to illustrate morphological differences found in the species or to demonstrate local variations. Few species of reptiles and amphibians are currently represented in the museum collection.

No known threatened, endangered, or rare species are found in the park.

- e. **Fish.** The Mancos River flows through the park on a portion of the eastern boundary, and the aquatic life found in this body of water in the park has not been studied to date. Each species of non-endangered fish found in the park may be represented by a limited series of specimens: One adult specimen of each sex, and the limited number of specimens required to document morphological differences within the species.

Figure E.1. Example Approved Scope of Collection Statement (continued)

No endangered, threatened, or rare species are known in the park.

- ✓ **Artefacts and Artifacts.** Both human history occurring in the park should be documented by a wide range of specimens, but no more than will fill the smallest conceivable size of packing tray. These items and any related evidence may be presented in whole. However, items of greater value because of their importance should also be collected and be represented by a small representative collection. It should be noted that this may not always be true in the case of some historical specimens, but it is more likely that many old items will be lost or destroyed during any cleaning process that would be necessary.

Items of importance in park management (e.g., park rules, museum pieces, and other documents) occurring outside the park should be similarly represented. No known non-collected or endangered items are found in the park.

- ✓ **Other Archaeology.** Archaeology other than those referred to above, both ancient and historical, are not well documented in the park. A small collection of finds could easily be made in the future. These objects may be represented in the park by the smallest number of specimens required to reasonably document them.
- ✓ **Historical Records.** All records associated with operations carried on in the park and those that occurred in the operation of the park should be collected. These records include field notes, diary entries, maps and drawings of surveys, maps, site plans, and other relevant field recordings. Any other historical records held by the park should be collected. These records may be represented in the park by the smallest number of specimens required to reasonably document them and form a collection and will represent historical data from operations conducted in the park, and required to reasonably document the history of the park.

IV. CONCLUSION

- ✓ **Archea and Artifacts.** The minimum number of basic documents will be collected, and records may be required in addition to types of information with less concern, found in the park should be collected. Historical specimens may be selected if needed to illustrate various aspects of operations conducted within the park area.
- ✓ **Historical Records.** All records associated with operations carried on in the park and those that occurred in the operation of the park should be collected. These records include field notes, diary entries, maps and drawings of surveys, maps, site plans, and other relevant field recordings. Any other historical records held by the park should be collected.

Figure 5-1 Example Approved Scope of Collection Statement continued

sensing data; copies of contracts; correspondence; repository agreements; specialists reports and analyses; reports and manuscripts; specimen inventories and field catalogs; analytical study data; computer documentation and data; tabulations and lists; specimen preparation records; conservation treatment records; and reports on all scientific samples lost through destructive analysis.

3. Paleontology

Uncontrolled surface collecting by visitors and park staff is discouraged. Fossils found on the surface by visitors should not be removed from their original location by the finder. They should be reported to park staff. If materials are turned in to park staff, appropriate measures must be taken to ensure that the visitor collects no more material, that precise provenience information is recorded, if possible, and that the objects/data are promptly turned in to the Mesa Verde Research Center upon receipt by staff members.

- a. **Invertebrate Fossils.** Each species found in the park should be represented by the minimum number of specimens required to fully document the horizontal and stratigraphic range of the species and the various habitats in which each species was fossilized. The collection contains a representative and well-documented collection of invertebrates, mainly from the Mancos Shale Formation.
- b. **Associated Records.** All records associated with specimens collected in conjunction with paleontological research are retained with the specimens as part of the museum collection. These records include field notes; daily journals; maps and drawings; photographic negatives, prints, and slides; videotapes; sound recordings; raw data sheets; remote sensing data; copies of contracts; correspondence; repository agreements; specialists reports and analyses; reports and manuscripts; specimen inventories and field catalogs; analytical study data; computer documentation and data; tabulations and lists; specimen preparation records; conservation treatment records; and reports on all scientific samples lost through destructive analysis.

III. MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

The *Native American Graves Protection and Repatriation Act of 1990* (NAGPRA), 25 USC 3001-13, requires, in addition to other actions, a written summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony. The park's holdings that fall into these NAGPRA categories are listed in a Servicewide summary that was distributed to all Indian Tribes, Alaska Native villages, and Native Hawaiian organizations on October 27, 1993. Copies of this summary are on file in the park.

NAGPRA requires a written, item-by-item inventory of human remains and associated funerary objects to be completed no later than November 16, 1995. The park has human remains or

Figure E.1. Example Approved Scope of Collection Statement (continued)

associated funerary objects subject to *NAGPRA* in its museum collection. As of October 17, 1995, the park completed the inventory of Native American human remains and funerary objects. Copies of this inventory are on file in the park.

IV. ACQUISITION

The park acquires objects for its museum collections by gift, purchase, exchange, transfer, field collection, and loan. Acquisition of museum objects and archival and manuscript collections are governed by the park's ability to manage and preserve them according to NPS *Management Policies* (Dec 88), Chapter 5, the standards for managing museum objects in NPS-28, *Cultural Resources Management Guideline*, the revised Special Directive 80-1, "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections," (Mar 90), and the NPS *Museum Handbook*, Part I, "Museum Collections."

In accordance with NPS policy the park will discourage gifts with restrictions or limiting conditions. Incoming loans will be acquired only for a particular purpose such as research or exhibition, and for a specified period of time. Museum objects are acquired, accessioned, and catalogued in accordance with the NPS *Museum Handbook*, Part II, "Museum Records." In accordance with NPS-44, *Personal Property Management Guideline*, Chapter 9, all proposals for the acquisition of firearms and ammunition, except archeological field collections, must be reviewed by the System Support Office (SSO) Curator. Acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review by the SSO Curator and Law Enforcement Specialist.

The Park Superintendent, by delegation, represents the Director and the Secretary of the Interior in accepting title to and responsibility for museum objects. The Superintendent bears the ultimate responsibility for the acquisition and proper care and management of the museum collection. The Superintendent has delegated the day-to-day care of the collection to the park curator.

All acquisitions must receive formal approval from the Park Superintendent before they can be accepted into the museum collection. Upon receipt, all newly acquired objects and related documentation must be turned over to the park curator. The park curator prepares, for the Superintendent's signature, all instruments of conveyance, and letters of thanks, acceptance, or rejection, and transmits them as appropriate, to the donor, lender, vendor, or other source of acquisition.

Donors of Ancestral Pueblo or other such cultural material must be able to demonstrate legal title to the materials and prove that they were not illegally removed from public lands. Gifts of this type of material are not ordinarily accepted unless they have been collected in a scientific manner and have adequate provenience data associated with them.

Collecting, either under permit or by park staff, will be approved only in response to the park's need for on-site reference or to establish baseline data. The museum collection will not be a repository for cultural or natural science specimens in excess of these needs.

Figure E.1. Example Approved Scope of Collection Statement (continued)

V. USES OF COLLECTIONS

To fulfill the goals of the park as described in the introduction, the park's museum collections may be used for exhibits, interpretive programs, research, and other interpretive media (e.g., publications based on museum objects or archival and manuscript collections). The governing consideration in the use of museum objects or archival materials is the conservation of each item in question and of the collection as a whole.

In accordance with NPS *Management Policies* (Dec 88), Chapter 7, the park will not exhibit Native American disinterred skeletal or mummified human remains or photographs or replicas of them. There will be no display of grave goods or other objects if Native Americans who are culturally affiliated with them object to such exhibit.

Researchers and other specialists may examine objects and archival materials under the conditions and procedures outlined in NPS-28, *Cultural Resources Management Guideline* and in the park's written "Guidelines for Access to the Museum Collection." Outside researchers normally must submit a research proposal to the Park Superintendent for review by the park's research committee. The research proposal is presented for review during consultation with different Pueblo tribes before access to the collection is granted. Any interpretive use that may be defined as consumptive must be authorized in advance, as outlined in NPS-28, Chapter 9 and NPS-6, *Interpretation and Visitor Services Guideline*.

Objects may be loaned out to qualified institutions for approved purposes in accordance with NPS *Museum Handbook*, Part II, Chapter 5, Outgoing Loans (1995). Institutions must meet minimal museum standards for security, handling and exhibition of NPS museum objects. Sensitive materials may require additional conditions prior to a loan commitment. Expenses related to loans of museum objects, including shipping and insurance, will normally be assumed by the borrower.

Photographs of museum objects are made available on a limited basis to provide an indirect use of the museum collection through publications and exhibits. Many of the park's archeological artifacts have been illustrated in publications.

All exhibits containing museum objects must have proper security, appropriate environmental controls, and proper mounts to ensure the long-term preservation of the objects.

VI. RESTRICTIONS

Restrictions in addition to those applying to the use of the museum collection outlined in Section IV of this statement are as follows:

Curatorial staff should consult with Tribal governments, Native Hawaiian organizations, Alaskan Native corporations, and traditional religious leaders about the terms and conditions for management of collections from Federal lands that have significance for these groups; and should consult with other indigenous and immigrant ethnic, social, and religious groups that have aboriginal or historic ties with the museum collection or lands of origin, and/or traditionally have used the museum collection. Archeological objects in the museum collection shall be made available to persons for

Figure E.1. Example Approved Scope of Collection Statement (continued)

use in religious rituals or spiritual activities in accordance with *36 CFR 79*, Section 79.10(c), "Curation of Federally-owned and Administered Archeological Collections". Requests to borrow non-archeological material for religious ritual or spiritual activities will be addressed on a case-by-case basis.

The park will not approve research on human remains and associated funerary objects without the consent of the affected group(s).

Mesa Verde National Park will not knowingly be a partner to or encourage in any way the trafficking in illicitly or unscientifically collected materials.

NPS Management Policies, (Dec 88), Chapter 5, state: "Information regarding the location, nature, and character of archeological, historic, and ethnographic resources may be exempted from public disclosure." *NPS Management Policies*, (Dec 88), Chapter 5, state: "The identities of community consultants and information about sacred and other culturally sensitive places and practices will be kept confidential when research agreements or other circumstances warrant."

Restrictions may be placed on the publication of images or manuscripts in the museum collection if these materials are subject to copyright, and this right has not been signed over to the National Park Service.

All endangered, threatened, or rare plants and vertebrate and invertebrate animals will be collected only when accidentally killed or when dead from natural causes. The collection of threatened, endangered, or rare plant and animal species will comply with *NPS Management Policies* (Dec 88) and will be in accordance with the provisions of the *Endangered Species Act of 1973*, as amended, and will be strictly limited according to the applicable rules of the U.S. Fish and Wildlife Service. Specimens of species meeting these criteria may be added to the collection if they are accidentally killed or found dead of natural causes.

Final disposition of type specimens will be determined at the Servicewide level and will adhere to recognized conventions established for specific disciplines.

The following specific restrictions are applicable to:

Accession #231: The donor, Mr. S. L. Palmer, Jr., has stipulated that the records pertaining to this collection "remain as a unit" at Mesa Verde National Park.

Accession #333: The donor, Ms. Mary Jane Colter, stipulates that the Service must not refer to the objects included in her gift as a "collection."

Figure E.1. Example Approved Scope of Collection Statement (continued)

VII. MANAGEMENT ACTIONS

This Scope of Collection Statement must be reviewed every two years, and when necessary, must be revised to remain supportive of and consistent with any changes in the park's mission. Any revision to this document requires the approval of the Park Superintendent.

The park has an approved Collection Management Plan. It was approved on June 22, 1988.

The park staff is compiling data on collections in other institutions which were removed from archeological sites within Mesa Verde National Park. Major collections were removed from the archeological sites presently within the park boundaries before its creation in 1906 and during the first two decades of the park's existence. The list of institutions in the United States that have important collections from Mesa Verde includes: the Colorado Historical Society in Denver, Phoebe Hearst Museum of Anthropology in Berkeley, the Smithsonian Institution, and the University of Pennsylvania in Philadelphia, and the National Biology Survey Museum of Southwest Biology in Albuquerque, NM. Part of the material removed from Mesa Verde prior to its establishment as a National Park has not remained in the United States. A notable collection made in 1891 by the Swedish scientist Gustav Nordenskiold is presently in the Finnish National Museum at Helsingfors, and in the Ethnografiska Museum in Stockholm. These collections still contain a wealth of information which has not been fully analyzed to date.

The continued use of cataloged historic furniture in public spaces is being evaluated in accordance with NPS guidelines.

Recall of objects loaned to the park is a possibility. The park needs to seek ownership of exhibited objects on long-term loan in order to prevent potential disruption of permanent interpretive exhibits.

Figure E.1. Example Approved Scope of Collection Statement (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

Unit's Name: _____

Draft _____ Approved _____

Date: _____

Reviewed by: _____ Date: _____

	YES	NO
A. Does the SOCS have <i>TITLE PAGE</i> ?	—	—
1. Is Title Page format correct? [MH-I,2:6]	—	—
2. Does Title Page include all required signatures and dates?	—	—
B. Does the SOCS have <i>INTRODUCTION</i> section?	—	—
1. Is purpose of SOCS stated? [MH-I,2:5]	—	—
2. Are NPS legal authorities (laws) to acquire and preserve museum objects cited? [MH-I,2:5&7]	—	—
3. a. Is unit's mission stated? b. Is unit's enabling legislation cited? c. If applicable, is subsequent unit's legislation cited?	— — —	— — —
4. If applicable, is there a statement indicating that museum collection is mandated by unit's enabling or subsequent legislation?	—	—
5. <i>Unit's Interpretive Themes</i> : a. Are interpretive themes listed? b. Are interpretive periods listed? c. If available, are appropriate planning documents (title/date) cited?	— — —	— — —
6. <i>Unit's Resource Management Goals and Objectives</i> : a. Are pertinent cultural and natural resource management goals and objectives listed? b. If available, are appropriate planning documents (title/date) cited?	— —	— —
7. <i>Mandated Collections</i> : a. Is statement, citing <i>43 CFR 7.13</i> and <i>NPS Management Policies</i> (Dec 88), pp. 5:3-4, made that archeological collections are managed as part of the unit's museum collection? [MH-I,2:8] b. Is statement citing <i>36 CFR 2.5g</i> made relevant to curatorial requirements for natural history specimens collected by approved permits? [MH-I,2:8]	— —	— —
8. Is there a discussion of the significance and history of the collection (optional)?	—	—
9. Are other laws, regulations, conventions, and special directives relevant to acquisition of museum objects cited? [MH-I,2:8-9]	—	—
10. If applicable, are any special unit designations (e.g., MAB Reserve, National Historic Landmark, World Heritage Site) that may be pertinent to museum collection cited?	—	—

Figure E.2. Checklist for Evaluating Scope of Collection Statements

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	YES	NO
C. Does the SOCS have <i>TYPES OF COLLECTIONS</i> section?		
1. Is there a brief profile of the unit's museum collection? [MH-I,2:9-10]	—	—
2. Is there an introductory statement indicating that INTRODUCTION section states purpose of collection?	—	—
3. Is section divided into two major categories: Natural History Collection and Cultural Collection?	—	—
4. <i>Natural History Collection Category:</i>		
a. If appropriate, is there a statement that the unit does not collect/maintain a natural history collection for its own purposes?	—	—
b. If unit collects/maintains a natural history collection is there an introductory paragraph that briefly outlines the purpose of this collection? [MH-I,2:10-11]	—	—
c. Is major category subdivided into disciplines (Biology, Geology, Paleontology) pertinent to unit?	—	—
d. Is each discipline subdivided into collecting categories that reflect unit's purpose for collection?	—	—
e. If appropriate, under each collecting category:		
1) Is current representation of object types described?	—	—
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	—	—
3) Are limits (quantities) defined?	—	—
f. Is there a collecting category for "associated records," under each discipline?	—	—
g. Does paleontology discipline include a statement relevant to "uncontrolled surface" collecting?	—	—
5. <i>Cultural Collection Category:</i>		
a. Does introductory paragraph include a statement that describes the purpose of this collection? [MH-I,2:11-12]	—	—
b. Does introductory paragraph state that an object or archival and manuscript collection from site or directly associated to person(s) or event(s) commemorated by the unit is more desirable than a similar object without such primary association?	—	—
c. Is major category subdivided into disciplines pertinent to the unit (Archeology, Ethnology, History, Archives)?	—	—
d. Is each discipline subdivided into collecting categories that reflect the unit's purpose for collection?	—	—
e. If appropriate, under each collecting category:		
1) Is current representation of object or archival types described?	—	—
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	—	—
3) Are limits (quantities) defined?	—	—
f. Does archeology discipline include collecting categories for "artifacts and specimens" and "associated records"?	—	—
g. Does archeology discipline include a statement relevant to "uncontrolled surface" collecting?	—	—

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	YES	NO
D. Does the SOCS have <i>MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990</i> section?	—	—
1. Does section contain appropriate statement regarding the required summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony? [MH-I,2:20-21]	—	—
2. Does section contain appropriate statement regarding the required inventory of human remains and associated funerary objects? [MH-I,2:21]	—	—
E. Does the SOCS have <i>ACQUISITION</i> section? [MH-I,2:21-22]	—	—
1. Is there a statement describing types of potential acquisition sources?	—	—
2. Does section include statement that acquisition of objects is governed by unit's capability to preserve its museum collection in accordance with NPS <i>Management Policies</i> (Dec 88), NPS-28, Special Directive 80-1, and NPS <i>Museum Handbook</i> , Part I (Sep 90)?	—	—
3. Is there a statement that discourages gifts with restrictions or limiting conditions?	—	—
4. In accordance with NPS-44, Chapter 9, does section state that the acquisition of all firearms and ammunition, except those recovered from field collections, must be reviewed prior to acceptance by the SSO curator?	—	—
5. Does section state that acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review prior to acceptance by SSO curator and law enforcement specialist?	—	—
6. Does section state that museum objects must be acquired, accessioned, and catalogued in accordance with NPS <i>Museum Handbook</i> , Part II?	—	—
7. Is there a statement regarding delegation of authority to the unit's superintendent to accept title to and responsibility for museum collections?	—	—
8. Does this section outline any park-specific acquisition procedures that supplement NPS policies?	—	—
F. Does the SOCS have <i>USES OF COLLECTIONS</i> section? [MH-I,2:23]	—	—
1. Is there a description of desired and acceptable uses?	—	—
2. Is there a statement regarding conservation as a primary consideration when determining uses?	—	—
3. In accordance with the NPS <i>Management Policies</i> (Dec 88), Chapter 7, page 5, "Interpretation and Native Americans," does section state that unit shall not place skeletal or mummified human remains, grave goods or other objects considered sacred on display?	—	—
4. Is there a statement regarding access to museum collection?	—	—
5. Does section reference NPS-28 and NPS-6 relevant to potentially consumptive uses of museum objects?	—	—
6. Does section reference NPS-28 relevant to research/destructive analysis of museum objects?	—	—

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	YES	NO
G. Does the SOCS have <i>RESTRICTIONS</i> section? [MH-I,2:23-24]		
1. Does section include a statement regarding consultation with Tribal governments, Native Hawaiian organizations, Alaskan Native Corporations, and traditional religious leaders? [MH-I,2:24]		
2. Does section state NPS policy relevant to disclosure of information on location, nature, and character of archeological resources?		
3. Does section state NPS policy relevant to keeping confidential identities of community consultants and information about sacred and other culturally sensitive places and practices?		
4. Is there a statement regarding use of objects subject to copyright?		
5. If appropriate, is there a statement relevant to the collecting of endangered, threatened, or rare species?		
6. Does section identify any legal restrictions on disposition or uses of the unit's museum collection?		
H. Does the SOCS have a <i>MANAGEMENT ACTIONS</i> section? [MH-I,2:25]		
1. Are there statements that require the following:		
a. Periodic review of SOCS?		
b. SOCS remains supportive of and consistent with unit's mission?		
c. Unit superintendent's approval of any revisions to SOCS?		
2. Does section document existence of or need for a Collection Management Plan?		
3. If any collections are located outside the unit's boundaries, is a brief description of each collection and name and location of each repository identified?		
I. <i>Comments/Recommendations</i> (If needed, attach additional pages.):		
<input type="checkbox"/> See attached copy of unit's approved or draft Scope of Collection Statement for editorial comments.		
<input type="checkbox"/> Determine information needed to evaluate questions answered by "ND" ("Not Determined").		
<input type="checkbox"/> Revise the SOCS to correct the deficiencies noted in the checklist. See NPS <i>Museum Handbook</i> , Part I, Chapter 2, Scope of Museum Collections (1994), Section C, for guidance on writing a Scope of Collection Statement.		

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

APPENDIX F. NPS MUSEUM COLLECTIONS MANAGEMENT CHECKLISTS

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APPENDIX F. NPS MUSEUM COLLECTIONS MANAGEMENT CHECKLISTS

A. NPS INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES

The revised NPS Special Directive 80-1 (March 1990), "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections" by reference includes the NPS "Inspection Checklist for Museum Storage and Exhibit Spaces." A copy of this checklist is included in this section.

Special Directive 80-1 requires that each park/center use the checklist to conduct a museum collections self-assessment in order to update progress of how well they are preserving and protecting the museum collections in their custody. Every three years parks are required to use this checklist to update data on deficiencies, costs for correction, and corrective actions taken relevant to museum collections preservation and protection. The data compiled from the completed checklists is used to update regional and Servicewide assessment of conditions, to more effectively distribute any funding allocated for correcting identified deficiencies, and to prepare periodic Internal Control Program Reports.

Use this checklist to inspect and evaluate the park's and center's storage and exhibit spaces. It is designed as a tool to help parks and centers evaluate how successfully they are preserving and protecting the museum collections in their custody. The basic requirements to meet NPS preservation and protection standards are listed in numerical order under the headings: museum collections storage, museum environment, security, fire protection, housekeeping, and museum planning. Page 2 of the checklist provides instructions for completing the self-assessment.

NOTE: The standards and requirements outlined in Special Directive 80-1 have been incorporated into Part I of the NPS Museum Handbook. However, Special Directive 80-1 remains in effect.

NATIONAL PARK SERVICE
Special Directive 80-1 (Revised 1990)

NPS INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES

COVER SHEET

Park/Center Name: _____

Organization Code: _____ Acronym: _____ Telephone No.: _____

Completed by: _____ Date: _____
(Name and Title)

Reviewed/Approved by: _____ Date: _____
(Superintendent/Center Manager)

NOTE: Parks may have two or more facilities (e.g., visitor center, room in historic structure, barn, park headquarters, maintenance shop) that house museum collections. Parks may also have two or more spaces that house museum objects within one facility (e.g., storage and exhibit).

In order to avoid having to complete a separate checklist for each facility or space, list each facility or separate space (e.g., storage or exhibit) in Table 1, "Park Facilities Housing Museum Collections." Use a separate line for each facility or space. Enter the appropriate function of the museum space: "E" for exhibit and "S" for storage. See example entry in table. Each facility with its designated space can then be referenced in the checklist by its "Facility Code" number. Each number is keyed to a facility and a specific museum space.

TABLE 1: PARK FACILITIES HOUSING MUSEUM COLLECTIONS

Facility Code	Name and Type of Facility	Museum Space
0	Sugarlands Visitor Center (Example Entry)	E, S
1		
2		
3		
4		
5		
6		
7		
8		

See the reverse side of this cover sheet for instructions on completing the attached checklist.
National Park Service

INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

Instructions for Completing this Checklist

1. The attached checklist is designed as a tool to assist parks and centers in conducting a self-assessment on how successfully they are preserving and protecting the museum collections in their custody. Basic requirements to meet NPS preservation and protection standards are listed under the headings: museum collections storage, museum environment, security, fire protection, housekeeping, and museum collections planning. Use the checklist to inspect and evaluate the conditions in each storage and exhibit space in the park or center. Refer to Special Directive 80-1 (Revised 1990) for the standards and basic requirements to meet NPS preservation and protection standards for museum collections. **PLEASE PRINT IN INK OR TYPE ALL RESPONSES.**
2. Complete the information required on the top portion of the cover sheet. List the park facilities housing museum collections in Table 1 on the cover sheet of this checklist. Only one checklist needs to be completed regardless of the number of facilities.
3. Complete the information required on page 3 of the checklist.
4. Under each of the major headings of the checklist (e.g., museum collections storage, museum environment, security, fire protection, housekeeping, and museum collections planning) indicate on the line in parentheses the facility/facilities that apply to this heading by entering the corresponding facility code number recorded in the table on the cover sheet.
5. After each requirement, check YES or NO. A "NO" response indicates a deficiency at one or more facilities. In the "Deficiency" space use the appropriate facility code number to indicate the location of the deficiency. Then briefly describe the deficiency. If the requirement is not applicable, print "N/A" in the "NO" response space.
6. Under the "Corrective Action" Block, describe what action is to be taken to correct the deficiency. The action might be solved in one step (e.g., change the lock, purchase a storage cabinet) or it might be solved in more than one step (rehabilitate an existing storage space). If corrective action requires more than one step, describe the steps to be taken. For correction of deficiencies that require funding, it may be necessary to program funds. Include the step of programming for funds in this block.
7. Under the "Proposed Action Completion Date" Block enter the target date for correcting the deficiency. Entering two dates may be necessary: (1) Date that programming for funds has been completed; (2) Projected date for actual deficiency to be corrected, contingent on availability of funding.
8. Use page 24 of the checklist if additional space is required to describe deficiencies or corrective measures. Key additional information to checklist page number and item number (e.g., Page 4, Item 4 [Continued]:).
9. Complete Table 3 on page 27 of the checklist. If known, enter the estimated cost to correct identified deficiencies on each line. To determine costs, review programming documents (e.g., Forms 10-238 and 10-237), and budgets for new construction projects and repair/rehabilitation projects. Consult with the Regional Curator for assistance in determining costs. **Remember: Accurate estimates are important: Servicewide plans and long-range programming and budgeting are based on these data.**
10. Ensure that the Park Superintendent or Center Manager reviews, signs, and dates the checklist prior to submitting it to the Regional Office.

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS STORAGE

1. Are museum objects stored in a facility located within the park?

YES NO

If the reply is "YES", continue to complete the checklist, including the Museum Collections Section, beginning on page 3.

If the reply is "NO", do not complete the Museum Collections Section of the checklist. On page 3, print "N/A" on the "Facility Codes" line under the heading "Museum Collections Section."

2. Are park museum objects stored in an NPS or non-NPS repository located outside the park?

YES NO

Note: NPS repositories include a storage facility located in another park and collection preservation centers. Non-NPS repositories include universities and museums.

If the reply is "YES", complete Table 2. See sample entries in table.

TABLE 2: REPOSITORIES OUTSIDE PARK HOUSING PARK MUSEUM COLLECTIONS

MUSEUM COLLECTIONS STORAGE
(Facility Codes: _____)

Dedicated Purpose:

1. The museum storage area is used solely for storage of museum objects.
2. The curatorial office and research and work areas are separated from the museum storage space.
3. Flammable liquids and materials, curatorial forms and supplies, and audiovisual equipment and other interpretive materials are stored outside the museum storage space.

YES NO

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

Physical Space:

4. The space is outside a floodplain.
5. The space is in an area that will not flood if pipes break or drains back up.

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS STORAGE (Continued)

6. The space is appropriately insulated to help maintain environmental conditions.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

7. If space has windows, they are blocked and insulated.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

8. Space has as few doors as possible to enhance security and environmental control, but has enough to meet requirements for employee safety.

YES NO

Deficiency:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS STORAGE (Continued)

Corrective Action:

Proposed Action Completion Date:

9. Space is as free of water, steam, drain, and fuel pipes as is practical.
10. Space is free of water, gas, or electric meters, electrical panels, and utility valves that require monitoring and servicing by non-curatorial personnel.

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

11. Space is sufficient for the movement of staff, equipment, and objects in and out without hindrances (e.g., inadequately sized doors; narrow, winding, or steep stairways; or low ceilings).

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS STORAGE (Continued)

12. Space is large enough to accommodate the current museum collection and the anticipated growth of the collection.

YES NO

13. Space is organized in a way that allows for easy access to museum objects and use of proper storage equipment.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

Methods and Techniques

14. Sufficient equipment (e.g., quantities, sizes, and appropriateness of cabinets, shelving units, specialized racks) is used to store and contain museum objects without crowding.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

MUSEUM COLLECTIONS STORAGE (Continued)

15. Museum cabinets are free of rust, have gaskets intact to provide good sealing action, have smoothly operating doors, and have working, keyed or combination lock mechanisms.

YES NO

16. Museum cabinet drawers are not loaded beyond 50 lb. capacity.

YES NO

17. Museum cabinets are not stacked more than two high.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

18. Open shelving is free of burrs, splinters, exposed nails, screws, bolts that can damage objects.

YES NO

19. Museum objects on shelving are not stacked upon each other.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS STORAGE (Continued)

20. Museum cabinets and shelving units are raised off the floor at least 2 inches if on casters or appliance rollers or at least 4 inches (preferable 6 inches) if stationary as a precaution against potential flooding and to facilitate cleaning of floors and inspection for pest problems.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

21. Closed cell polyethylene foam is used in museum cabinet drawers and on shelving to cushion objects.

YES NO

22. Objects in museum cabinets are placed in specimen trays, padded or otherwise prevented from shifting when drawers are opened and closed.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

MUSEUM ENVIRONMENT

(Facility Codes: _____)

Temperature and Relative Humidity:

1. Levels of relative humidity and temperature in storage and exhibit spaces are monitored on a daily basis to provide an accurate and complete picture of all changes in both of these environmental factors during each year.
2. A record of daily observations, noting occurrences such as unusual exterior climatic conditions, leaky roof, re-calibration of equipment, or an unusual visitation pattern, is maintained to help explain any variations in relative humidity and temperature readings.
3. Records of relative humidity and temperature readings and of daily observations are permanently retained in the park's or center's curatorial files.
4. Records of relative humidity and temperature readings and of daily observations are reviewed and analyzed monthly to determine relative humidity and temperature highs, lows, and means; and the frequency and extent of fluctuations.

YES ____ NO ____

YES ____ NO ____

YES ____ NO ____

YES ____ NO ____

Deficiency:

Corrective Action:

Proposed Action Completion Date:

5. Working with the Regional Curator and other specialists, the park or center has established optimum relative humidity and temperature levels and acceptable highs and lows.

YES ____ NO ____

Deficiency:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM ENVIRONMENT (Continued)

Corrective Action:

Proposed Action Completion Date:

Light:

6. The visible spectrum of light is monitored for illuminance level and duration, is controlled, and meets the standard in Special Special Directive 80-1 (Revised 1990). YES NO
7. Levels of natural light (daylight) have been recorded quarterly for one year to establish seasonal variations. YES NO
8. If park or center has a record of annual seasonal variations, a periodic spot check is made to ensure that levels do not exceed the upper limits for sensitive objects. YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

9. UV radiation is controlled by a filtering material that has UV absorbing properties. The filtering material is periodically monitored to ensure its continued effectiveness. The level meets the standard in Special Directive 80-1 (Revised 1990). YES NO

Deficiency:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM ENVIRONMENT (Continued)

Corrective Action:

Proposed Action Completion Date:

Pests:

10. Monitoring (inspections) for evidence of insect, mold, and other pests infestations are conducted on an ongoing basis with especially close inspection of museum objects on a monthly basis.
11. The control of pests is coordinated with the park's or center's Integrated Pest Management Program.

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

Dust:

12. Dust covers are used on open shelving when objects are not otherwise protected from dust (e.g., in boxes).
13. Dust in museum storage and exhibit spaces is controlled as part of the park's or center's housekeeping program.

YES NO

YES NO

Deficiency:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM ENVIRONMENT (Continued)

Corrective Action:

Proposed Action Completion Date:

National Park Service

INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

SECURITY

(Facility Codes: _____)

Key Control:

1. Keys to museum storage spaces and exhibit cases are issued to only those employees having direct responsibility for the collections.
2. Issuing of keys to museum storage spaces and exhibit cases is strictly controlled by the use of a signed hand receipt (e.g., DI-105 or equivalent form).

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

Access Control:

3. Procedures have been written to control access to the museum collections by non-curatorial staff, outside researchers, and visitors.
4. All researchers, visitors, and non-curatorial staff who enter the storage area are escorted at all times by park curatorial staff.
5. A visitor/researcher sign-in log is used to record name and address of visitor, date of visit, time entered and time departed, and reason for visit.

YES NO

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

SECURITY (Continued)

6. Opening and closing procedures for museum spaces are written, approved and practiced.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

7. Museum objects in exhibit spaces are given additional protection at times of high risk, such as during times of crowding or of special activities.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

8. The special needs of museum collections are incorporated into the park's or center's Emergency Operation Plan.

YES NO

Deficiency:

SECURITY (Continued)

Corrective Action:

Proposed Action Completion Date:

9. Entrances to museum spaces are equipped with metal or solid-core wood doors that have dead bolt locks.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

10. Intrusion alarm systems appropriate to the risks involved and to the nature of the museum collection are installed in museum storage and exhibit spaces.

YES NO

11. Installed intrusion alarm systems are inspected and maintained on a regular schedule to ensure that they are fully operational.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

SECURITY (Continued)

12. Small, highly sensitive and valuable objects housed in museum storage spaces are kept in cabinets with keyed or combination locks.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

13. Irreplaceable or particularly sensitive or valuable objects used in exhibits are protected in cases or by other means that provide protection from theft or vandalism, without making curatorial access impractical.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

FIRE PROTECTION
(Facility Codes: _____)

1. Fire detection and suppression systems appropriate to the risks involved, to the nature of the museum collection, and to the structure housing the collections are installed.
2. Fire detection and suppression systems are inspected and maintained on a regular schedule to ensure that they are fully operational.

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

3. An appropriate number and type of fire extinguishers are installed according to the anticipated types of fires, the nature of the collection, and the size of the protected area.

YES NO

4. Fire extinguishers are inspected annually to ensure that they are operational.

YES NO

5. Staff are trained in the use of fire extinguishers.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

FIRE PROTECTION (Continued)

6. Museum objects on top of shelving or museum cabinets do not obstruct the discharge heads for fire suppression systems and are not closer than 18" to the ceiling.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

7. Structures and spaces housing museum collections (e.g., walls, floors, ceilings, doors, windows, and other penetrations) are made fire-resistant to the extent possible, given the nature of the structure.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

8. All paper museum records are kept in a locking, insulated safe, file, or vault that will maintain an interior temperature of less than 350°F during a one-hour exposure to exterior temperatures of at least 1700°F.

YES NO

9. If the container described in statement #8 is housed on a level of a building above grade, the container also is rated to withstand a drop of 30 feet.

YES NO

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

FIRE PROTECTION (Continued)

Deficiency:

Corrective Action:

Proposed Action Completion Date:

10. Magnetic media (floppy disks and tapes) which back up NPS Automated National Catalog System (ANCS) data files are stored in a container (e.g., media safes, media files, mixed media files, and media boxes) that will maintain an interior temperature of not more than 125°F during a one hour exposure to an exterior temperature of 1700°F.
(Note: Media boxes are acceptable only when inserted in an appropriately rated insulated records file.)

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

FIRE PROTECTION (Continued)

11. Flammable liquids and materials are housed outside museum storage spaces and, regardless of where stored, such materials are housed in approved flammables storage cabinets with proper ventilation.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

12. The special needs of museum objects are incorporated in the park's or center's Structural Fire Plan.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

HOUSEKEEPING

(Facility Codes: _____)

1. A housekeeping plan has been written for museum storage and exhibit spaces.
2. Housekeeping in museum storage and exhibit spaces is performed according to the plan's established schedule.
3. The housekeeping plan for museum spaces is reviewed annually and revised as is necessary.

YES NO

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

4. Smoking, drinking, and eating in museum storage and exhibit spaces are prohibited in writing.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

HOUSEKEEPING (Continued)

5. Relative humidity and temperature monitoring equipment is calibrated quarterly.
6. If a hygrothermograph is used to monitor relative humidity and temperature, it is regularly maintained (e.g., linkage is cleaned, ink is replenished).

YES NO

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS PLANNING

1. The needs of the museum collection are adequately addressed in project statements that are included in the park's Resources Management Plan (RMP).

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

2. The park or center has an approved Collection Management Plan (CMP).
(If the response is yes, indicate the approval date under corrective action.)

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

3. The park or center has an approved Collection Storage Plan (CSP).
(If the response is "NO", and there is a special need for this plan, independent of a CMP, complete the information below. If there is no need for a Collection Storage Plan, print "N/A" in "NO" block.)

YES NO

Deficiency:

National Park Service
INSPECTION CHECKLIST FOR MUSEUM STORAGE AND EXHIBIT SPACES (Rev. 1990)

MUSEUM COLLECTIONS PLANNING (Continued)

Corrective Action:

Proposed Action Completion Date:

4. Exhibit plans and historic furnishings reports are reviewed by park curatorial staff to ensure the proper use, preservation, protection, and maintenance of museum objects.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

5. Through a Collection Condition Survey, conservators have provided the park an assessment of the condition of objects on exhibit and in storage and have provided guidance on setting priorities for conservation treatment.

YES NO

Deficiency:

Corrective Action:

Proposed Action Completion Date:

E. List of Figures

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Cost Estimates (2005)

NOTE: \$/SF = costs per square foot

Administrative Offices (For costs, see appropriate categories below.)

Museum Collection Storage	Dollars
<u>Museum Facility</u>	
• Renovating an existing facility.....	.68-113/SF
• Constructing a new facility (DSC designed and coordinated project, does not include site preparation).....	248-363/SF
• Insulated Modular Structures (IMS) - recommended only for use inside an existing structure. (See COGs 4/7 and 4/8). Costs range from small structures without HVAC, security, and fire protection systems that are assembled by unit staff to large structures with HVAC, security, and fire protection systems that are assembled by a contractor.....	60-145/SF
• IMS within an enclosing wood frame or masonry structure built specifically to accommodate the IMS. The cost includes climate control, security and fire protection systems.....	106-220/SF
• Park-built structures, including climate control, security and fire protection systems.....	100-175/SF
• Contractor-built structures, including climate control, security and fire protection systems.....	100-200/SF

NOTE: Construction costs vary with the type, size, and configuration of the structure; the locality (costs in Alaska could double those cited); the difficulties of site preparation; and the complexity of the HVAC, security, and fire protection systems. Costs for systems range from \$4-15/SF for fire detection/suppression systems, \$4-6/SF for intrusion detection systems, and \$22-44/SF for HVAC systems. The cost for architectural and engineering planning such as facility preliminary design (Title I) and design and specifications (Title II) may be absorbed in the overall cost of the building (if contractor or park designed and constructed), cost up to \$20/SF if obtained separately, or be 17% of the overall project cost if DSC designed and constructed.

Equipment and Supplies

• Retrofit gasket kit.....	40
• Sash lock	12
• Standard museum cabinet w/10 drawers	775-1,410
• Doublewide museum cabinet w/10 drawers.....	1,135-1,984
• Wardrobe cabinet w/specialized storage interiors (depends on interior).....	1,700-3,300
• Herbarium cabinet, counter height (12 compartments).....	567
• Herbarium cabinet, full height (26 compartments).....	765
• Entomology cabinet, counter height (15 drawer openings).....	680
• Entomology cabinet, full height (24 drawer openings).....	1,185-2,356
• Cornell drawers for entomology cabinets.....	41
• Security gun vault with acrylic museum assemblies.....	2,000
• High density moveable-aisle storage systems	125/SF
• Slotted metal angle for constructing large shelving units (bundles of 10 - 12' angle pieces with 75 nuts and bolts) (2 bundles are needed for unit of 3 shelves measuring 4'x8'; 3 bundles are needed for unit of 5 shelves measuring 4'x8').....	160/Bundle
• 5/8"-3/4" plywood sheets for shelving	40/sheet

Figure F.1. Cost Estimates (2005)

	<u>Dollars</u>
• Steel shelving units	250/unit
• Map cabinet 5-drawer unit (need 2 units for counter height)	760
• Map cabinet base units	250
• Sanitary platform for standard museum cabinet	68
• Sanitary platform for doublewide museum cabinet	87
• Sanitary platform for wardrobe cabinet	128
• Safety stacking rim for standard cabinet	35
• Lumber, plywood and paint to construct wooden platform (labor not included) for Standard museum cabinet	45
Doublewide and wardrobe cabinet	55
• Flammable liquid cabinet (various sizes)	200-700
• GSA utility cabinet for forms and museum supplies	240
• Costs for polyethylene foam, specimen trays and specialized containers as listed in the NPS <i>Tools of the Trade</i> vary greatly. Call vendors listed in the NPS <i>Tools of the Trade</i> for current prices. Units may order modest quantities of these materials through the Museum Supply and Equipment Program, Museum Management Program.	
NOTE: The costs for equipment do not include shipping. Shipping costs can be as high as 1/3 of the cost of the equipment when shipped in the contiguous United States, higher when shipped to Alaska, Hawaii, Guam and other locations outside the continental United States.	
Museum Exhibit	
Equipment and Supplies	
• Replacing an exhibit case	
Table top or pedestal exhibit case	2,800-11,000
Walk-in-style exhibit case	11,000-33,000
• Retrofitting existing exhibit case	
Retrofit of exhibit case, e.g., surfaces/paints, graphics/furniture replacement	2,200-5,500
Retrofit of exhibit case structure, e.g., physical security, lighting component	3,000-11,000
Retrofit of object mount, e.g., single mount, garment manikin	550-3,300
NOTE: Exhibit replacement and retrofitting costs vary with the size and complexity of the exhibit case. Factors affecting cost include whether or not there is a need for specialized humidity control, lighting, security and museum mount features; the availability of specialized contractors; and the proximity of contractors to the park.	
Museum Environment	
Museum Facility	
HVAC System	24-46/SF
Equipment and Supplies	
• Hygrothermograph	625
• Datalogger (temperature and RH recording)	55-565
• Remote probe for datalogger (for use in exhibit cases)	200

Figure F.1. Cost Estimates (2005) (continued)

	<u>Dollars</u>
• Datalogger computer software for setting up instruments and analyzing data.....	95-140
• Electronic thermohygrometer (depending on brand and style)	325-1,000
• Sling psychrometer.....	25-125
• Aspirated psychrometer.....	423
• Hygrometer	30-100
• Portable dehumidifier (refrigerant type).....	300
• Portable dehumidifier (desiccant type).....	1,000
• Humidifier	300
• Portable air purifier with HEPA and activated carbon filters.....	450
• Visible light meter.....	150
• UV (ultraviolet radiation) meter.....	1,500
• Vacuum cleaner (HEPA).....	600-1,100
• UV fluorescent filtering sleeves	7
• UV filtering Plexiglas	
8" x 10" sheet.....	10
20" x 24" sheet.....	45
4' x 8' x 1/4" sheet.....	300
• UV filtering film professionally installed on windows	10/SF

Security

Museum Facility

Intrusion detection system (approximate minimum \$2,000) 5-7/SF

Equipment and Supplies

• Recoring locks (contact locksmith or maintenance staff for costs)	40-60
• Locking key boxes	275-450
• Metal or solid core doors.....	50
• Deadbolt locks.....	50

Fire Protection

Museum Facility

• Fire detection system.....	5-7/SF
• Fire suppression system	
Wet pipe system (includes smoke or heat detection system)	10-15/SF
Dry pipe system (includes smoke or heat detection system).....	12-16/SF

NOTE: Costs increase if the system requires the installation of a new dedicated National Fire Protection Association (NFPA) approved 4" or 6" water line or if there is a need for a water storage reservoir. Specific estimated costs for installation of water line and storage reservoir include:

• Pipe installation	43/LF
• Backflow preventer	12,650
• Gate valve	1,330-2,100
• Water meter and box	11,400
• Connection to existing line	2,900
• 10,000 gallon steel on-grade storage reservoir	40,250
(Prices vary with capacity and type of construction.)	

Figure F.1. Cost Estimates (2005) (continued)

	<u>Dollars</u>
Equipment and Supplies	
• ABC fire extinguisher (20 pound unit).....	70
• ABC fire extinguisher (10 pound unit).....	50
• Flammable liquid cabinet	200-700
• Four-drawer insulated file cabinet.....	840
• Media vault.....	245
• Media safe (various sizes)	3,000-16,000
Professional Assistance and Museum Planning	
• Assistance with establishing optimum relative humidity and temperature levels	3,500-6,000
• Security Survey	9,000-12,000
• Fire Protection Survey	9,000-12,000
• Collection Management Plan	12,000-25,000
• Collection Condition Survey	10,000-20,000
• Collection Storage Plan.....	7,000-13,000
• Integrated Pest Management Plan	10,000-15,000
• Housekeeping Plan	10,000-15,000

Figure F.1. Cost Estimates (2005) (continued)

NATIONAL PARK SERVICE CHECKLIST FOR PRESERVATION AND PROTECTION OF MUSEUM COLLECTIONS

**Department of the Interior
National Park Service
National Center for Cultural
Resources Stewardship and
Partnership Programs
Museum Management Program**

April 1996

Figure F.2. NPS Checklist for Preservation and Protection of Museum Collections

- damage to collection

Evidence of current infestation (frass and droppings, tunnels and holes, nests)

IPM Program

- IPM Coordinator

- pest traps

- written log

- periodic inspections

Potential attraction and harborage sites

- kitchen (food storage)

- appliances

- plumbing/water source

- cracks and gaps

- trash removal (overnight)

Pesticides

- unauthorized use of PDB or dichloroos

VI. MUSEUM STORAGE

Existing Storage Condition

Location of museum storage

- attic

- basement

- water pipes/roof leaks

- available space (sq. ft.)

- additional space needed (compactor system, superinsulated building)

- load limitations

- space utilization (aisle widths, cabinet arrangement)

Dedicated storage

- non-museum storage

- restricted access

Exclusively curatorial functions

- percent of collection in storage

- type of museum objects

- organization of storage (by material or object type)

- size of objects stored

Storage equipment

- number of cabinets

- type of cabinets

- standard/double specimen cabinets

- wardrobe/jumbo GL-C cabinets

- visual storage cabinets

- entomology cabinets

- herbarium cabinets

- map cabinets

- security gun vaults

- art storage racks

- fire-insulated file cabinets

- steel shelving

- equipment needed

- condition of cabinet gaskets seals

- cabinet locks

Storage methods

- dustcovers
- elevated off floor
- polyethylene drawer liners/shelf pads
- ethafoam cavity packing
- museum objects stored on furniture
- stacking/crowding

Curatorial workspace

- separate from storage area
- examining table
- other equipment

Off-site storage

- leased space
- regional NPS repositories
- non-NPS repositories (documented loans)

Condition of Objects in Storage**Collection condition Survey needed****Storage materials**

- inert, archival quality
- acid-free, buffered or unbuffered
- specimen trays
- padding

Periodic inspection for deterioration

- frequency
- evidence of deterioration
- conservation treatment needed

Condition of types of objects

- textiles (small--flat; large--rolled)
- costumes (flat or padded hangers)
- books (boxes, interleaving paper)
- unframed prints (print boxes)
- paintings & framed prints (racks)
- maps (flat in folders)
- manuscripts & archives (acid-free folders and document boxes)
- photographic prints & negative (photo envelopes)
- ceramics & glass
- furniture
- metals (iron, steel, copper, bronze, silver, pewter)
- firearms
- archeological artifacts
- wet specimens
- skins
- freeze-dried/taxidermy specimens
- herbarium
- wagons, carriages
- other _____

VII. MUSEUM EXHIBITS**Existing Exhibit Conditions****Locations**

- visitor center

- other exhibits with museum objects

Furnished historic structures

- approved furnishing report

- implementation of furnishing plan

- tour arrangements (average group size, guided/self-guided)

- placement of objects away from vents/light

Exhibit cases and construction

- UV glass

- inert materials

- curatorial access

- security (tamper-free)

- air tight (gasket seals)

- object mounts

Exhibit lighting

- low-voltage, cool lights

Exhibit maintenance manual

Rehabilitation needed

Condition of Objects on Exhibit

Collection Condition Survey needed

Neutral barriers between objects of dissimilar materials (mylar, acid-free matboard)

Evidence of deterioration

- conservation treatment needed

- weekly/daily inspections

Types of objects and exhibit techniques

- framed prints (acid-free mats/backs and UV glass)

- manuscripts & books (rotated/turned)

- textiles & costumes (refolded/rotated)

- wood furniture (waxed)

- silver (polished or lacquered)

- iron and steel (microcrystalline wax)

- natural history specimens

- other

Reproductions

- cataloged

- substituted for fragile original

Objects accessible for visitors to touch

- NPS-6 consumptive use waived

VIII. HOUSEKEEPING AND CYCLIC MAINTENANCE

Existing Conditions

- museum storage

- exhibits

- dust

- clutter

Written housekeeping manual

- cleaning methods

- cleaning materials

- schedule

Equipment

- vacuums (backpack, portable)

- Endust-treated mops
 - other equipment and supplies
- Proper handling of museum objects
- Cyclic preventive building maintenance
- Maintenance Management System (MNS)
- Personnel
- maintenance staff (supervisor)
 - curatorial staff
 - training in curatorial housekeeping
- Storage of cleaning supplies and equipment

IX. MUSEUM STAFFING

- Curator (1015 series)
- Museum Technician (1016 series)
- Park Ranger with collateral duty
- Supervisor/park division (Interpretation/Resource Management)
- Museum Aid
- Training and experience of incumbent
- Training needs
- Curatorial Methods
 - Critical Issues
 - ANCS
 - other
- VIPs and student interns

X. PLANNING, PROGRAMMING, AND FUNDING

- Park planning documents include collections
- Statement for Management (SEM)
 - General Management Plan (GMO)
 - Outline of Planning Requirements (OPR)
 - Resources Management Plan (RMP)
 - Project Programming statements (Form 10-238)
- Funding sources
- ONPS (base funding)
 - Cultural Resources Management Funds
 - Cultural Cyclic Maintenance Funds
 - Cooperating associations
 - other

C. NPS CHECKLIST OF REFERENCE DOCUMENTS FOR COLLECTION MANAGEMENT PLAN TEAM

The checklist contained in this section provides a list of park related documents (e.g., legislation, park-specific plans, general park information, park museum operational procedures, curatorial budget, curatorial position descriptions and performance standards) that the team members will need to review and evaluate. Some of these documents (e.g., Scope of Collection Statement, Statement for Management, Interpretive Prospectus, Special Directive 80-1, NPS Checklist for Museum Storage and Exhibit Spaces, Annual Collection Management Reports) may be requested ahead of the team's site visit.

**NATIONAL PARK SERVICE
CHECKLIST OF REFERENCE DOCUMENTS FOR COLLECTION MANAGEMENT PLAN TEAM**

Legislation

- Enabling legislation, presidential proclamation, or executive order
 Subsequent legislation
 Congressional background reports
 Other: _____

General Information

- Brochure(s)
 Handbook
 Other: _____

General Park Plans

- General Management Plan
 Development Concept Plan
 Statement for Management
 Resources Management Plan (Cultural & Natural - including project statements related to collections and facilities housing them)
 Outline of Planning Requirements (Inventory of Park Requirements)
 Statement for Interpretation
 Interpretive Prospectus
 Park Administrative History

Plans and Documentation Specific to Museum Collections

- Scope of Collection Statement
 Exhibit Plan(s) (Including list of objects)
 Historic Furnishings Report(s)
 Collection Condition Survey(s)
 Collection Storage Plan
 Completed Special Directive 80-1 Checklist [update for current conditions]
 Annual Collection Management Report (Form 10-94)
 Collection Management Plan (park generated)
 Collection Management Checklist/Curatorial Operations Evaluation Report
 Annual Inventory of Museum Property

Other Pertinent Resource Management Plans

- Historic Resources Study
 Historic Structure Report(s)

Historic Structure Preservation Guide(s)

Ethnographic Plans

Archeological Plans

Other: _____

Park Museum Collection Management Procedures

Procedures for access and use of museum collection

Opening and closing procedures for museum exhibit and storage spaces

Housekeeping plans/schedules

Park's Emergency Operation Plan (including Structural Fire, Physical Security, Disaster/Emergency Plans)

Integrated Pest Management Plan

Building/facility cyclical maintenance manuals/schedules

Other Park Procedures and Documents Relevant to Collection Management

Construction drawings or blue prints for buildings housing museum collection (visitor centers, storage rooms, furnished historic structures, etc.)

Basic Operating Plan

Staffing/organization chart

Position description(s) for staff assigned curatorial responsibilities

Performance standards for staff assigned curatorial responsibilities and supervisor

FY ____ budget

Cooperative agreements

Requests for Base Increase Form 10-237

Development/Study Package Proposal Form 10-238

Operation/Field Area Evaluation

Current permits for collecting natural history specimens (36 CFR 2.5g) expected to generate specimens for the museum collection

Appendix G: Protection of National Park Service Museum Collections

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APPENDIX G. PROTECTION OF NATIONAL PARK SERVICE MUSEUM COLLECTIONS

A. Overview

This appendix contains information that supports the guidance we provide in *NPS Museum Handbook*, Part I, Chapter 9, Museum Collections Security and Fire Protection and Chapter 10, Emergency Planning. In this appendix you will find:

- NPS standards for security and fire protection
 - Definitions of security and fire protection terms
 - Sample statements of work for security and fire protection surveys
 - Sample standard operating procedures and agreements
 - Mandates and requirements for emergency management
-

B. NPS Standards for Security and Fire Protection

1. What general standards do I need to meet?

- Identify all threats that may affect the museum collection and take steps to counter those threats.
- Ensure that the park's museum protection program applies to everyone on the staff.
- Implement a thorough and vigorously enforced fire prevention program in buildings housing museum collections and museum records.
- Ensure that systems for detecting and controlling access meet Underwriters Laboratories (UL) standards and systems for detecting and suppressing fires meet UL and National Fire Protection Association (NFPA) standards.
- Establish a process for evaluating plans for building and exhibit construction and rehabilitation to ensure that security and fire protection objectives will be met.

The NPS Checklist for Preservation and Protection of Museum Collections (1996) includes mandatory standards for museum security and fire protection. See *MH-I*, Appendix F: NPS Museum Collections Management Checklists, Section A for guidance.

2. What security standards do I need to meet?

- Issue keys to storage rooms and exhibit cases only to those employees who have a frequently (at least daily) recurring need for direct, unaccompanied access to collections.
- Control the issuing of keys strictly by using signed hand receipts (Form DI-105, "Receipt for Property" or its equivalent).

- Write and implement procedures for access to museum collections.
 - Ensure that researchers or qualified visitors entering a space housing museum objects are accompanied at all times by someone on the park museum staff.
 - Maintain a visitor log to record non-museum staff entries into museum storage and work areas.
 - Write and implement opening and closing procedures for museum exhibit, storage, research and work spaces.
 - Equip museum storage rooms with secure metal or solid-core wooden doors in substantial frames. Equip those doors with deadbolt locks and other appropriate security hardware, such as non-removable pin hinges.
 - Install and maintain intrusion detection systems appropriate to the nature of the facility, the nature and value of the collection, and to the known threats.
 - Ensure that intrusion detection systems are inspected and maintained on a regular schedule.
 - House highly sensitive and valuable objects (such as firearms) in storage cabinets of an appropriate design with keyed or combination locks.
 - Protect irreplaceable or particularly sensitive or valuable objects on exhibit by using appropriate mounts, cases, or security electronics (or some combination of the three) or by other means that will protect them from theft or vandalism without making curatorial access or visitor viewing impractical or difficult.
 - Give museum objects, especially those on exhibit, additional protection at times of high risk, such as during special events or when exhibit galleries are particularly crowded, or when uniquely threatened, such as by terrorist threats or attack or during times of civil unrest.
3. *What fire protection standards do I need to meet?*
- Incorporate the needs of museum objects and museum records in the Structural Fire Plan.
 - Keep all museum property records (paper and electronic) in appropriate locking fire-resistant filing cabinet, safe, or walk-in vault.
 - Protect spaces housing museum collections by automatic fire detection and suppression systems appropriate to the risks involved, the nature of the collection, the nature of the fires that could occur in those spaces (including attention to fuel types and loading), the nature of the structure, and the capabilities and timeliness of responding forces.
 - Protect spaces housing collections by appropriately rated, sized, and located portable fire extinguishers.

- Instruct designated park staff in proper techniques to prevent and suppress fires and in emergency evacuation and protection of people, structures, and collections.
 - Ensure that storage shelves and cabinets and exhibit cases do not obstruct discharge of a suppression agent. Minimize potential damage to objects from agent discharge by ensuring that objects are in cabinets or under protective covers.
 - Keep flammable solvents and supplies in museum work spaces only when kept in UL approved safety containers stored inside UL approved flammable storage cabinets. Never house flammable solvents and supplies in collection storage spaces.
 - Prohibit smoking and open flames in collection storage, work, and exhibit areas.
 - Store cellulose nitrate photographic negatives and motion picture film and other flammable or hazardous objects separately from the rest of the museum collection.
 - Construct storage areas and, where possible, exhibit areas of fire-resistant materials.
-

C. Museum Security and Fire Protection Surveys

1. *What are the subjects that I need to address in a security survey?*

The outline below lists subjects that may be addressed during a protection survey.

- The Park or Facility
 - Name or other identifier
 - Function or purpose
 - Location (including proximity to other facilities and communities)
 - Physical nature of the facility and its surroundings
 - Climate
 - Staffing (including nature and size of staff, hours, seasonal variations)
 - Visitor access (including visitor use characteristics, numbers of visitors, hours, seasonal variations)
 - The law enforcement situation (including type of jurisdiction, reaction/response times)
 - Site loss history (including nature/impact of past criminal activity, nature/impact of other loss events, subsequent mitigating/preventive actions, current loss control policies, programs, procedures)

- Perimeter Security (External)

- Perimeter barriers and access points: nature and effectiveness (including fences, natural barriers, clear zones, underground passages)
- Cover (such as vegetation) for possible illegal activity
- Lighting (including nature, location and areas of coverage, maintenance and testing, power supply, circuit, and switching reliability, tamper resistance, operation)
- Access points (including controls such as gates, locks, and surveillance)
- Patrols (including nature, frequency, and seasonal variations)
- Intrusion detection system (including type of system, power supply, tamper resistance, signal transmission method(s) and supervision)
- Inspection, testing, and maintenance, operating procedures and instructions, and monitoring of alarms

- The Structure Housing Museum Collections

- Perimeter security (such as doors, windows, loading docks, walls, roofs, floors, basements, attics, and underground tunnels)
- Interior security (such as connecting doors and pass-throughs, walls and interior windows, ceilings and spaces above them, floors and crawl spaces, duct work, storerooms, closets, utility rooms, vaults, storage cabinets, elevators and stairwells, and hiding places)
- Locks and related hardware (including types, mounting, and cyclinders and keys)
- Interior lighting (including security, emergency types, mounting, and cylinders and keys, lighting reliability)
- Intrusion detection system (including detectors, controls, tamper resistance of wiring and components, alarm transmission methods and supervision, inspection, testing, and maintenance, operating procedures and instructions, monitoring of alarms)
- Fire detection systems (including detectors, controls, power supply, tamper resistance of wiring and components, alarm transmission methods and supervision, inspection, testing, and maintenance, operating procedures and instructions, monitoring alarms)
- Fire suppression systems (including appropriateness relative to threats, reliability, supervision, inspection, testing, and maintenance, response to activation)
- Fire prevention programs (including policies and procedures, housekeeping, staff training, evacuation)

- Safes, vaults, and media containers (including type, location, capacity, and use)
- Procedures
 - Key and combination control (including policies and procedures, documentation/records, and security of keys and cores)
 - Building opening and closing (including policies and procedures, checklists, and monitoring by management)
 - Housekeeping practices
 - Employee screening, investigation, and identification
 - Package and material control
 - Visitor control (including control of visitors to staff-only areas, passes, records of visits, and ID's for contractors, tradesmen, utility workers)
 - Visitor surveillance and inspection
 - Protection of administrative records
 - Security of cash and valuables
 - Control of access to restricted areas or facilities (including museum and non-museum staff)
 - Property inventory and control
 - Security communications (including methods, reliability, back-up power, employee operation, and efficiency and speed)
 - Incident reporting (including timeliness, accuracy, and records creation and maintenance)
- Individual Object Protection
 - Storage spaces (including physical construction, access control, housekeeping practices, storage cabinets and shelves, inventory and material movement, and intrusion detection systems)
 - Exhibit spaces (including case construction and object mounting, lighting of space and cases, surveillance by the staff, intrusion and tamper detection systems, inventory, and object removal/movement procedures)
 - Furnished rooms (including access control, intrusion detection systems, housekeeping practices, and inventory)

2. *Where can I obtain a sample scope of work for a security and fire protection survey?*

Figures G.1 and G.2 provide suggested language for a scope of work (SOW) statement for a security survey and a fire protection survey. When contracting for a combined security and fire protection survey, the two documents can be merged and redundant language eliminated. In the sample SOWs, the square brackets [] denote alternative words or phrases, one of which must be chosen and the other deleted, depending upon the situation. Square brackets also mark off optional words and phrases that may be applicable. The text for these sample statements of work is available on diskette or via cc:Mail from your SSO Curator.

D. Park Museum Protection Standard Operating Procedures and Agreements

1. *How do I organize museum standard operating procedures?*

In preparing park-level policy statements and procedures, it is important to distinguish between policies and procedures. Policies express what is allowed and not allowed. Procedures express how to carry out the policies (how, when, by whom, and under what circumstances you put the policies into effect.)

Museum facility standard operating procedures (SOPs) share certain common elements with all standard operating procedures. They all include the following information:

- **Why** the required actions should be performed. When the purposes for having the SOP are made clear, and when the responsible staff fully understand why they must do certain things, the procedures become more valuable.
- **Who** is to perform the required actions. Depending on the circumstances, the SOP may indicate responsibility by name or by position title. The SOP will say that the procedures are to be followed by staff who have the duty by virtue of some roster or work schedule (which you must identify in the SOP). Regardless of how it is done, it is essential that the SOP assign specific responsibility.
- **When** the required actions are to be performed. Usually, specific times are given for either initiating or completing the procedures. The times may vary seasonally or according to the day of the week. It may not be necessary to set a specific time for initiating each action. Simply setting a time to begin the procedures or a time by which they are to be completed will suffice.
- **Where** the required actions are to be performed. For example, an opening SOP might designate which building entrance is to be opened first, indicate where the intrusion detection system keypad and light switches are located, direct the sequential unlocking of specific emergency exit or other doors, specify where items needed during the procedure, such as flags, are to be found, and indicate which exhibit cases are to be checked.
- **How** the required actions must be performed or, as appropriate, may be performed. Unless there is a clear need for an action to be

performed in a certain way, however, it is best to allow the responsible persons flexibility in how they carry out their tasks. When an action must be performed in a certain way, as with operating an intrusion detection system or certain high-security locks, the SOP then should be as specific and detailed as necessary to ensure that it is done that way.

- **What** the results of the actions should be. For example, it is not sufficient to say something like "Check all exhibit cases." Instead, the SOP should say "Visually examine exhibit cases 4-13 for evidence of burglary or tampering during the night and for objects and graphics that might have fallen or come loose from their mounts. Inspect exhibit case access doors to ensure that they are still locked and that the locks are in good condition."

2. *Where do I find sample museum standard operating procedures and agreements?*

Figures G.3 through G.8 provide suggested format and language for park collection opening and closing procedures, access policies and procedures, and an agreement with a fire department. The sample documents are designed to cover all elements that normally need to be considered in most parks. You generally should follow the sample formats. However, the language may vary depending on your park's specific requirements and problems.

The electronic Museum Management Newsletter, issued by the NPS Museum Management Program, National Center for Cultural Resources Stewardship and Partnership publishes lists of park museum SOPs that are available upon request. Contact parks for copies of their SOPs. Some SOPs are available as WordPerfect files and can be furnished on disks or via cc:Mail either from the originating parks or your System Support Office (SSO).

3. *Where do I find additional help with preparing access policies and procedures?*

- *MH-II*, Appendix D, Museum Archives and Manuscript Collections
 - Section T. Providing Access to Archival and Manuscript Collections
 - Section U. Identifying Appropriate Restrictions for Archival and Manuscript Collections.
 - Section V. Implementing Access and Usage Policies for Archival and Manuscript Collections.
 - Section W. Monitoring and Tracking Researcher Use of Archival and Manuscript Collections
- Figure D.16. Researcher Registration Form (Sample)

- *MH-I*, Chapter 6, Handling, Packing, and Shipping Museum Objects
 - Section C. General Rules for Handling Museum Objects

4. *Where do I find a sample visitor log?*

See Figure G.6 for a sample visitor log. An unpunched full size visitor log accompanies this appendix. Keep the full size visitor log as a master and make copies for your use.

5. *Where do I find conditions for access to museum collections?*

See Figure G.7 for conditions for access to museum collections. An unpunched full size conditions for access to museum collections accompanies this appendix. Keep the full size document as a master and make copies for your use.

E. Mandates and Requirements for Emergency Management for Museum Collections

1. *What laws and regulations do I need to know?*
2. *What do the NPS Management Policies tell me?*

Emergency preparedness is addressed in a number of Federal laws and regulations. The focus of these laws and regulations is on protecting visitors or on broad, general issues of park management and resource protection. See U.S. Code Citations: USC 12 & 17; 16 USC 1a-6, 1b-1, and 3; 28 USC 1346 & 2672; and 31 USC 6483; and 36 CFR 1.5.

Chapter 5, Cultural Resource Management, requires:

- *Emergency Management* [Page 5:14]: "The emergency operations plan for each park with cultural resources will address their protection or rescue in the event of an emergency or disaster."

Chapter 8, Use of the Parks, outlines:

- *Emergency Preparedness and Emergency Operations* [Page 8:6]: "The National Park Service will develop a program of emergency preparedness in accordance with the Federal Civil Defense Act (50 USC 2251 et seq.), National Security Decision Directive 259 (Feb. 4, 1987), departmental policy, and other considerations at the Washington, region, and park levels. The purpose of the program will be to maximize visitor and employee safety and the protection of property. This program will include a systematic method for alerting visitors to potential disasters and evacuation procedures.

Superintendents may assist other agencies with emergencies outside parks. To the extent practicable, written agreements with such other agencies in accordance with the Federal Assistance and Interagency Agreements Guideline (NPS-20) must first be in effect. NPS employees who are outside the area of their jurisdiction and who are directed by their supervisors to provide emergency assistance to other agencies will be considered to be acting within the scope of their employment.

NPS emergency operations will be conducted utilizing the Incident Command System (ICS) of the National Interagency Incident Management System (NIMS). Each park superintendent will develop and maintain an emergency operations plan to ensure an effective response to all types of emergencies that can be reasonably anticipated."

3. *What NPS guidelines do I need to know?*

NPS-28, Cultural Resource Management Guideline, is the general guideline for protecting and managing all cultural resources, including museum objects.

- *Chapter 4* provides general guidance on including cultural resources in the Emergency Operation Plan (EOP).
 - *Chapter 9* states that the needs of collections are incorporated in emergency operation plans and that EOPs identify protection and recovery priorities for the most significant objects in the collection.
4. *What are the NPS standards for museum emergency management?*
- Identify all disasters and other emergencies that could cause damage to or loss of the museum collection, in whole or in part.
 - Include in the EOP a description of methods for protecting collections in time of emergency or write a separate museum emergency plan that describes such methods.
 - Identify methods to mitigate against disaster-related damage, to the extent possible, and develop procedures for responding to and recovering from damages resulting from events that cannot be mitigated against.
 - Stockpile emergency materials for use during and after a disaster and take other appropriate preparedness measures in anticipation of emergencies.
 - Prioritize in the EOP museum objects according to their value and importance. Ensure that following a disaster, the most valuable or significant objects are given highest priority for emergency treatment.
 - Ensure that secure on-site or off-site storage is available for protecting collections if regular storage or exhibit space becomes unusable following a disaster. Keep arrangements for the emergency use of non-NPS space such as freezer plants, current at all times.
 - Establish cooperative or other agreements with local law enforcement, civil defense, and emergency response agencies, with other governmental and non governmental agencies, and with nearby NPS units regarding mutual aid in time of disaster.

F. Glossary

- **Air Sampling Smoke Detector:** A device that draws air through small diameter (generally less than $\frac{1}{8}$ ") tubing into a detector unit that uses either the ionization, photoelectric, or cloud chamber principle to analyze the quantity of smoke or combustion products in the sample. (Also called **Early Warning** or **Very Early Warning** detectors.)
- **Arson:** The malicious burning of or attempt to burn property. Generally, an entire building will be affected rather than specific objects or property contained within.
- **Automatic Sprinkler System:** A network of overhead pipes with spaced outlets (sprinkler heads) that open at a predetermined temperature to discharge water onto a fire.
- **Barriers:** Tools for physical security designed to prevent, restrict, or delay access to a protected area or object.

- **Burglary:** Breaking and entering with the intent to commit a felony, usually theft, although vandalism also is common.
- **Capacitance Motion Detector:** A motion detector designed to detect motion close to a protected object, generally used to detect and discourage touching of high value exhibits, such as wall hangings or paintings. The device generates a capacitance field 4-6" from the protected object that detects any electrical conductor that enters the field.
- **Central Station:** A privately owned alarm monitoring system monitored by personnel who will report alarms to the police or fire department and to designated members of the staff of the protected site. A central station may be owned by the protected site (proprietary) or by a commercial business (commercial central station).
- **Civil Disturbances:** Disturbance of civil order and the peace. This activity may be organized or spontaneous; may be indiscriminate, involving the park as a consequence of its location, or discriminate, involving the park as a planned target; and may be a prelude to other criminal activity, especially vandalism and larceny and possibly robbery and assault.
- **Class A Fire:** A fire in ordinary combustibles (such as wood, paper, rubbish, and many plastics).
- **Class B Fire:** A fire in petroleum products, flammable gases and other flammable liquids (such as paints, thinners, and solvents).
- **Class C Fire:** A fire in energized electrical equipment and wiring, where the non-conductivity of the extinguishing agent is important.
- **Contact Switch:** A normally open or normally closed electrical switch that triggers an alarm when the switch changes position. Examples include magnetic door and window contacts, plunger switches, and roller or ball switches.
- **Crime Prevention:** Anticipating, recognizing, and appraising the risk of a crime and initiating actions to remove or reduce the risk.
- **Cycling Sprinkler System:** A sprinkler system similar to a **Preaction System**, except that a separate heat detection system both opens and closes the control valve at predetermined temperatures. After the valve closes, if the fire rekindles, it reopens and water again flows from the opened heads. The valve will continue to open and close in accordance with the temperature sensed by the heat detection system.
- **Dry Pipe Sprinkler System:** A sprinkler system used in areas where temperatures below 32° F are expected. Pipes are filled with air or nitrogen under pressure. When fire opens a sprinkler head, air pressure in the system drops, releasing a valve, letting water flow into pipes and discharge from the open sprinkler(s).
- **Dual Technology Motion Detector:** A motion detector that combines two detection technologies (such as microwave/passive infrared or ultrasonic/passive infrared) to minimize unwanted alarms. Both technologies must detect motion before the device signals an alarm.
- **Duress Alarm:** A personal protection device (also known as a panic or hold-up alarm) consisting of a manually operated switch that triggers a local or remotely monitored alarm to summon assistance.
- **Embezzlement:** Appropriating fraudulently to one's own use or benefit property entrusted to one's care. The property stolen might be sold (fenced) or retained for the personal use of the embezzler.

- **Fire Protection Survey:** A survey of fire prevention and personnel training programs, structural and procedural fire hazards, maintenance of protective systems, and overall effectiveness of the fire protection program.
- **Flame Detector:** Device that detects radiant energy (such as infrared, ultraviolet, or both) that may or may not be visible to the human eye, such as glowing embers or coals, as well as flames.
- **Glass Break Detector:** Device that detects breaking glass. There are two types: frequency discriminators and metallic foil or wire. **Frequency Discriminators** detect the high frequency sounds generated when glass breaks. **Metallic Foil or Wire** is a ribbon of lead foil or small wire that carries an electrical current. It is attached to the glass around the perimeter of a window so when the glass breaks, the foil or wire breaks, breaking the electrical circuit, causing an alarm.
- **Heat Detectors:** Heat-responsive devices either of the spot or line type, designed to respond when the operating element reaches a predetermined temperature (**Fixed Temperature**), when the temperature rises at a rate exceeding 15°F per minute (**Rate-of-Rise**), or when the temperature of the air surrounding the device reaches a predetermined level, regardless of the rate of temperature rise (**Rate Compensation**). Some have both fixed temperature and rate-of-rise features.
- **Industrial Disasters:** Involves an explosion, structural collapse, hazardous materials release, fire, a major accident, nuclear incident, major power outage or utility loss, and a serious break in water, sewer, or gas line.
- **Ionization Detectors:** A device that detects small combustion particles generated in the flame stage of a fire.
- **Larceny:** Unlawful taking or stealing of property or articles of value without the use of violence or fraud. There is a presumption that the property was not entrusted to the care of the person committing the theft. A presumption of theft also can be raised by possession of recently stolen property.
- **Line-Type Heat Detector:** A heat sensitive wire or tube, which triggers an alarm when the temperature in the protected space increases at a rate of 15°F, or greater, in a minute.
- **Line-Type (Photoelectric Beam) Smoke Detector:** A device that projects a beam of light (in the infrared range) to a receiver across an open area. The receiver measures light diffraction to detect smoke. These detectors often are used to protect large gallery-type spaces with high ceilings.
- **Local Alarm System:** A fire or intrusion detection system that causes an audible or visual alarm at the protected site, but which is not monitored off-site.
- **Magnetic Contact:** A detection device that uses a magnet mounted on a movable surface to open or close a contact switch mounted on a fixed surface.
- **Microwave Motion Detector:** A device that transmits electromagnetic energy in the microwave range (radar). The device measures the amount of energy reflected back to it and detects motion based on the doppler effect (a frequency shift that occurs as an object moves toward or away from the detector).
- **Natural Catastrophe:** Involves an earthquake, volcanic eruption, landslide, flood, hurricane, tornado, tidal wave, lightning, or wildfire.
- **On-Off Sprinkler Head:** A sprinkler head used on a standard wet-pipe system that makes the system act like a **Cycling Sprinkler System**. The difference is that each individual sprinkler head contains a temperature-sensitive device that opens the head at a predetermined temperature and closes it automatically.

when the temperature falls to a preselected point. Systems with on-off sprinkler heads operate independently of the fire alarm system.

- **Passive Audio or Sonic Sensors:** Audio and sonic sensors detect sound. An **Audio Sensor** is a sound activated microphone that transmits sounds from the protected space to a loud speaker in the monitoring station so the person monitoring the sensor hears what is going on in the protected space. **Sonic Sensors** are frequency discriminators that detect sound in the frequency range associated with movement.
- **Passive Infrared Motion Detector (PIR):** A device sensitive to infrared heat in the range generated by the average human body. The detector transmits no energy, but uses a series of heat sensitive elements to cover the protected area in a pattern of zones resembling the fingers on a hand. The device detects motion when a heat source moves from one detection zone to another. Everything has an infrared signature, and many mimic that of the human body (for example, a large animal or a radiant heater).
- **Photoelectric Beam Motion Detector:** A device with a transmitter that projects a beam of infrared light across an open space to a receiver. The receiver may be located directly across from the transmitter, or the light beam can be directed around the room with a series of small mirrors. Photoelectric beam devices may use just one beam or, to minimize unwanted alarms, several beams (stacked array).
- **Photoelectric Detector:** A device that detects large combustion particles in visible smoke.
- **Physical Security:** All measures intended to prevent acts of violence against persons and destructive or unauthorized access to, or removal of, property.
- **Preaction Sprinkler System:** A type of dry pipe sprinkler system with the water supply controlled by a fire detection system (either smoke or heat detection) wired so an alarm opens a valve to let water flow into the system piping. After the supply valve opens, the preaction system operates like a wet-pipe system.
- **Pressure Mat:** A pressure-sensitive mat, usually placed under a rug or carpet, to detect an intruder stepping into the protected space.
- **Probability:** The likelihood of a threat becoming an actual loss event.
- **Risk:**
 - **Conventional Risk:** A condition that entails both the possibility of loss and gain, such as investing in the stock market.
 - **Pure Risk:** A condition that is loss-only oriented. Among the pure risks that threaten park assets are crimes, natural disasters, civil unrest, and accidents.
- **Risk Assumption:** Using existing resources to absorb losses as and when they occur.
- **Risk Management:** The process of identifying, evaluating, and eliminating as many risks as possible by selecting and implementing effective countermeasures.
- **Risk Transfer:** The process of transferring a risk to another entity for a fee. A known cost, such as an insurance premium, may be substituted for the chance of a greater loss.
- **Robbery:** Theft by violence or threat of violence to one's person. Also included under this heading is the taking of a hostage to force someone on the museum staff to open the building or a secure area within the building.

- **Security:** Security includes all techniques, procedures, equipment and planning intended to prevent loss of or damage to collection objects from criminal activity, negligence, fire, or other catastrophic events.
- **Security Survey:** The National Institute of Law Enforcement and Criminal Justice describes the security survey as "a critical on-site examination and analysis of an industrial plant, business or home, public or private institution to ascertain the present security status; to identify deficiencies or excesses; to determine the protection needed; and to make recommendation to improve the security."
- **Severity:** The impact or effect upon the assets or upon the organization if a loss does occur.
- **Shoplifting:** A specific type of larceny that involves theft of merchandise for sale. This threat is a concern when there are sales operations within the park.
- **Spot-Type Smoke Detector:** A device that detects products of combustion by either the ionization or photoelectric principle, covering a defined area (generally no more than 900 square feet per detector in an open space with ceiling height less than 15 feet).
- **Standpipe System:** A piping system in a building to which hoses are connected for emergency use by building occupants or by the fire department. Standpipe systems intended for fire department use normally do not have hoses permanently attached; responding fire personnel provide the hose and use the standpipe connection to reduce the amount of hose they must carry into the building. Such systems may be charged with water by fire department pumper. Standpipe systems intended for occupant use will have hoses, usually 1½ inches in size, already attached. Such systems usually are permanently charged with water.
- **Strain Sensor:** A device that detects the distortion that occurs on the under side of a joist, floor, or platform when weight is applied to the top surface.
- **Threat:** A potential to inflict harm or cause damage or loss.
- **Ultrasonic Motion Detector:** Similar to the microwave motion detector, except the device uses high frequency acoustic (sound) energy that will not penetrate solids.
- **Vandalism:** Willful or malicious destruction or defacement of objects, exhibits, or structures. This crime may be random and indiscriminate or directed toward a particular object, building, or exhibit. Vandalism is called sabotage if committed to hinder operations.
- **Vibration or Shock Detector:** A device that attaches directly to a protected object, an exhibit platform, or the structure of an exhibit case, which detects vibration, such as might occur when someone moves the protected object or strikes the protected exhibit case.
- **Warded Lock:** A lock with gates to which the correct key aligns to allow movement of the bolt and with internal wards, or obstructions, that block the entry or turning of an incorrect key.
- **Wet Pipe Sprinkler System:** A sprinkler system in which the piping permanently contains water.

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SCOPE OF WORK
Museum Security Survey
[Park Name]

Purpose of Work

The work consists of conducting a museum security survey of the [facility/ facilities] described below. There are two purposes for the survey. The first is to reveal and identify weaknesses in existing protection systems, equipment, procedures, policies, and operations that could result in the loss of such museum resources as collections, collection records, and exhibits, as well as the museum [structure/structures] [itself/themselves]. The second purpose is to identify alternatives to correct any weaknesses or deficiencies that may be found. The ultimate goal of performing the survey[s] and of implementing corrective actions is protecting museum property against all forms of losses.

Description of Site[s] to be Surveyed

[Here describe the buildings--visitor center, furnished historic structure, storage facility--to be surveyed. Characterize it/them in terms of location, size, functions, construction, and nature of contents. Provide whatever information is deemed necessary for the contractor to have in advance. In particular, indicate the nature of exhibits to be surveyed, making clear whether they are conventional exhibits or furnished rooms or both. In most cases, the Scope of Work (SOW) statement will become part of the request for proposal sent out to prospective contractors. It is important that prospective contractors have sufficient information about the site and facilities to be surveyed to permit them to make responsive proposals. You may wish to attach more detailed information, such as park brochures, to the SOW to avoid having to put a lot of detail in this section.]

Scope of Work

The Contractor will survey the structures or facilities described above, identify security weaknesses and deficiencies, and make recommendations for their correction in a separate formal report. [If more than one park is involved, you should request a separate report for each park. Only rarely might you specify a separate report for each structure in the same park.] The Contractor will visit and survey operations and conditions at [the site/each site] for [number of days]. In addition, the Contractor will return to [the site/each site] an additional one-half day to orally present his/her findings and recommendations to the site staff[s]. After completion of the return visit, the final report[s] will be revised as necessary based on comments made during the oral presentation and submitted to the park.

In carrying out this work, the Contractor will perform at a minimum the following tasks:

1. Prior to identifying himself/herself to the staff, tour public spaces in each of the specified facilities as an ordinary visitor and observe conditions and activities affecting protection of the collections and the structures. [If visitors normally have to pay a fee for admission to the site, indicate in this paragraph that fees paid will constitute a cost-reimbursable expense.]
2. Meet with management and staff at each site including [Here specify by title each of the site staff that the contractor must meet. At a minimum, the contractor should meet with the superintendent, the chief ranger, and the park curator.] [At each site other/Other] staff may be interviewed as deemed appropriate by the local manager or necessary by the Contractor and as may be arranged by the local staff.

Figure G.1. Sample Scope of Work for a Security Survey

3. Evaluate the physical security of each building in both public and non-public areas. Note problems with perimeters, including doors, windows, air intakes, roof hatches, and other penetrations. Evaluate perimeter lighting, locks, hardware, hinges, and other security equipment and devices. Evaluate the ease with which someone could penetrate the perimeter with or without being detected. Observe and evaluate perimeter security during the daytime and after dark. Before conducting surveys after hours, inform the local superintendent or site manager of when and how they will be carried out; that will preclude harm to the Contractor or site staff and ensure cooperation of staff on the night shift.
4. Examine and evaluate the electronic alarm systems, including controls, detectors, exhibit case sensors, panic devices, alarm and signaling devices, remote monitoring equipment, remote alarm transmission media (including line supervision), and other pertinent components. Test the proper functioning of the systems and evaluate their operation and maintenance. Evaluate [*contract/proprietary*] central station services (monitoring, response, premises security, and maintenance support).
5. Examine security staffing for adequacy. Review staffing levels, position descriptions, performance standards, standard operating procedures, training, and delegations of responsibility for all personnel and staff components directly responsible for museum security. Evaluate protection of all areas by security personnel. Review the scheduling and conduct of security patrols. Evaluate adequacy of protection provided by interpreters during interpretive tours or programs. Evaluate the interpretive operations plan in respect to how well it incorporates security concerns into the responsibilities of interpreters. If guards are used on the night shift, evaluate their effectiveness and response capabilities and the extent to which they may be vulnerable to personal injury, attack, or accident during their rounds.
6. Evaluate security training or security awareness programs provided at the site for both security and non-security personnel.
7. Evaluate policies for and staff compliance with access and parcel controls in use at the site[s], particularly in office and work areas, in exhibit areas, and in collections storage.
8. Evaluate security policies and procedures, including standard operating procedures, delegations of authority, and memoranda of agreement or understanding with local police and emergency agencies.
9. Evaluate key control and retrieval. Evaluate the adequacy of locking systems, key documentation, and key security. Determine whether card access or similar control systems would be appropriate and practical for securing or controlling access to buildings and to high-security areas, such as collections storage.
10. Evaluate internal security programs, particularly procedures to account for objects taken outside of collection storage and exhibit areas, such as in offices and workrooms or in transit.
11. Evaluate security for objects on exhibit and in storage, including case design, security hardware, detection systems, locks, keying, accountability procedures, and other internal control procedures and systems. In particular, evaluate the ease with which objects may be stolen from exhibits [*and furnished rooms*] without immediate detection of the act. Evaluate the ease with which objects on exhibit [*and in furnished rooms*] may be vandalized, with or without immediate detection.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

12. [This paragraph is needed only when historic structures are to be surveyed.] All recommendations for improvements to or replacements of systems and hardware will take into account and be sensitive to the historic nature of the structure[s]. As appropriate, alternative recommendations for equipment and/or installation techniques will be made to allow for maximum preservation of historic fabric.
13. Evaluate the timeliness, effectiveness, and accuracy of how the [site/sites] report[s] criminal or other incidents involving collections.
14. Observe and comment on other security problems that may be noted during the survey[s]. Evaluate park policies and documentation for all security procedures not otherwise specified above.

Standards

The following published documents shall be considered the standards against which Contractor shall evaluate security at the site[s]. The first [qty] items are available for loan to Contractor upon request. The remaining items are standard industry publications which should already be available to Contractor.

[Here list relevant documents, such as: NPS Museum Handbook, Part I; NPS-28 "Cultural Resource Management Guideline"; NPS-44 "Personal Property Management Guideline"; NPS-50 "Loss Control Management Guideline"; NPS Management Policies; Special Directive 80-1 and NPS Checklist for Preservation and Protection of Museum Collections; and any other NPS documents that may be relevant. List the American Society for Industrial Security (ASIS) Suggested Guidelines in Museum Security; and other industry publications.]

Protection of Information

All information and documentation gathered or produced by the Contractor during the course of this work shall be held in strictest confidence and shall be fully protected from access by unauthorized persons. Any documentation furnished by the site[s] and retained by the Contractor during the course of the work or thereafter shall be secured in a locked filing cabinet or safe at a minimum. During the initial visit to the site[s], the Contractor shall indicate to the superintendent[s] the manner in which he/she intends to secure any documentation the site[s] may furnish; the superintendent[s] will have the prerogative to specify when more stringent security must be provided for any particular documentation furnished to the Contractor. Documentation that cannot be secured to the superintendent's[s'] satisfaction still will be furnished to the Contractor, but only for on-site use.

Notes and other information produced by the Contractor, including all versions and copies of his/her report and any drawings that may be produced, shall be secured in a locked filing cabinet or safe, at a minimum. Word processor and other computer files shall be secured in an equivalent manner, such as by retaining files only on diskettes kept in a safe, rather than on a hard drive, and by the use of passwords or encryption. During the initial visit to the site[s], the Contractor shall indicate to the superintendent[s] the manner in which he/she intends to secure computer data generated during the course of the work; the superintendent[s] will have the prerogative of specifying that additional security measures be taken whenever circumstances so dictate.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

Products, Deliverables, and Performance

1. Contractor should discuss his/her findings and recommendations with protection and museum staff at [the/each] site during the initial visit[s], and is encouraged also to discuss recommendations for corrective actions, but is not obliged to do so. Contractor has an ethical obligation to verbally point out serious protection weaknesses as they are encountered, if such weaknesses could, in his/her judgement, result in imminent loss of park resources.
2. Contractor shall prepare and submit a written report of survey [for each site visited]. The report shall present findings and recommendations for each applicable subject listed above in the Scope of Work and shall be organized in a logical, easily comprehended manner. [The/Each] report shall include an executive summary, a discussion of observations and problems (organized according to areas within [the/each] structure or according to each security issue, e.g., training, staffing, and hardware), a list of recommendations and possible alternative solutions for problem areas, a comprehensive prioritized list of recommendations, a list of recommended suppliers of security hardware and systems and cut sheets or other manufacturer's literature on recommended hardware or system components, and a bibliography of recommended readings on the specific protection problems and solutions presented in the report[s].
3. Submit draft reports to the park according to the schedule below. Reports will be reviewed promptly and returned with comments. Contractor will be expected to incorporate each comment into the report or be prepared to explain why doing so is not appropriate.
4. After approval of the second draft, return to [the/each] park for a followup visit. Orally present findings and recommendations to the assembled park staff. Orally respond to questions, comments, and concerns from the staff. [The/Each] presentation[s] should include a walk-through of the surveyed [facility/facilities] as necessary to make findings and recommendations clear. In order to ensure sufficient time for the presentation[s], [it/they] should be scheduled to allow for one-half day [per site].

Time for performance is [number of months]. [The] Initial site visit[s] must be completed within [number of days] from award of contract. The final report must be completed within [number of days] after completion of the initial visit[s]. [The following schedule of completion is suggested. Modify as instructed by your contracting officer.]

<u>Work Element</u>	<u>Completion Time After Award</u>
Initial site visits	[number of days]
Submit first draft of report[s] to park	[number of days]
Correct report[s] by Contractor	at Contractor's discretion
Submit second draft of report[s] to park	[number of days]
Correct report[s] by Contractor	at Contractor's discretion

Figure G.1. Sample Scope of Work for a Security Survey (continued)

<u>Work Element</u>	<u>Completion Time After Award</u>
Followup site visit[s] and present report[s] to park staffs	[number of days]
Complete final report[s]	at Contractor's discretion
Submit final report[s] to park staffs	[number of days]

Schedule of Partial Payments

Partial payments will be made upon successful completion of each successive phase of the work, as outlined below:

Initial site visit[s]	50%
Submit second draft[s] of report[s]	25%
Submit final report[s]	25%

Inspection and Acceptance

[Insert Name and Title] shall serve as the Contracting Officer's Technical Representative (COTR) on this project. The COTR is empowered to inspect and evaluate all work of this Contract for compliance with terms of this Scope of Work Statement.

Acceptance of the work of this contract and any changes to the terms of this contract shall be made in writing only by the Contracting Officer.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

SCOPE OF WORK
Fire Protection Survey
[Park Name]

Purpose of Work

The work consists of conducting a museum fire protection survey of the [facility/ facilities] described below. There are two purposes for the survey. The first is to reveal and identify weaknesses in existing protection systems, equipment, procedures, policies, and operations that could result in the loss of such museum resources as collections, collection records, and exhibits, as well as the museum [structure/structures] [itself/themselves]. The second purpose is to identify how to correct any weaknesses or deficiencies that may be found. The ultimate goal of performing the survey[s] and of implementing corrective actions is the protection of museum property against all forms of losses due to fire or to fire fighting activities.

Description of Site[s] to be Surveyed

[Here describe the buildings--visitor center, furnished historic structure, storage facility--to be surveyed. Characterize it/ them in terms of location, size, functions, construction, nature of contents. Provide whatever information is deemed necessary for the contractor to have in advance. In particular, indicate the nature of exhibits to be surveyed, making clear whether they are conventional exhibits or furnished rooms or both. In most cases, the scope of work (sow) statement will become part of the request for proposal sent out to prospective contractors; it is important that prospective contractors have sufficient information about the site and facilities to be surveyed to permit them to make responsive proposals. You may wish to attach more detailed information, such as park brochures, to the SOW to avoid having to put a lot of detail in this section.]

Scope of Work

The contractor will survey the structures or facilities described above, identify fire prevention, detection, and suppression weaknesses and deficiencies, and make recommendations for their correction in a separate formal report. [If more than one park is involved, you should request a separate report for each park. Only rarely might you specify a separate report for each structure in the same park.] The contractor will visit and survey operations and conditions at [the site/each site] for [number of days]. In addition, the contractor will return to [the site/each site] an additional one-half day to orally present his/her findings and recommendations to the site staff[s]. After completion of the return visit, the final report[s] will be revised as necessary based on comments made during the oral presentation and submitted to the park.

In carrying out this work, the contractor at a minimum will perform the following tasks:

1. Meet with management and staff at each site including [Here specify by title each of the site staff that the contractor must meet. At a minimum, the contractor should meet with the superintendent, the chief ranger, the chief of maintenance, the structural fire coordinator, and the park curator.] [At each site other/Other] staff may be interviewed as deemed appropriate by the local manager or as necessary by the Contractor and as may be arranged by the local staff.
2. Evaluate fire prevention policies, programs, and procedures in each building in both public and non-public areas. Examine existing policies and the extent to which they are appropriate to the resources being protected and actually are being followed. Examine the effectiveness of programs and procedures in preventing fires from starting.

Figure G.2. Sample Scope of Work for a Fire Protection Survey

3. Examine and evaluate fire detection and alarm systems, including sensors and detectors, manual pull stations, water flow and position indicating alarms, system controls, standby power, alarm and signaling devices, remote monitoring and annunciation equipment, remote alarm transmission media (including line supervision), and other pertinent components. Determine the extent to which systems comply with current National Fire Protection Association (NFPA) standards for the installation, operation, maintenance, and testing of fire alarm signaling systems (NFPA 72, National Fire Alarm Code). Report on the extent to which system components are listed by Underwriters Laboratories (UL). Test the proper functioning of the systems and evaluate their operation and maintenance. Evaluate [*contract/proprietary*] central station services (monitoring, response, premises security, and maintenance support).
4. Examine and evaluate the types, sizes, locations, etc. of hand-held fire extinguishers currently in use in the [*facility/facilities*] being surveyed. Determine whether different types or sizes would be more appropriate and whether existing extinguishers should be relocated or augmented with additional extinguishers. When extinguishers are concealed for aesthetic reasons, determine whether concealment poses the potential for such problems as delayed access or failure to use an otherwise available extinguisher. Evaluate procedures, programs, and schedules for testing fire extinguishers; determine whether proper records are created and maintained when extinguishers are tested.
5. Examine and evaluate the appropriateness, capacity, spacing, temperature rating, and hazard rating of fixed sprinkler systems. Examine and evaluate hose and standpipe systems inside the [*facility/facilities*] being surveyed. Examine and evaluate the suitability and locations of fire hydrants near the [*facility/facilities*] being surveyed. Determine whether different types or sizes of automatic and manual suppression systems would be more appropriate and whether additional units are required. Determine if water supplies provide the necessary flow rate and volume. Examine the maintenance and protection of fire department connections and the protection of water supply control valves.
6. Examine the adequacy of current staff in respect to their ability to prevent, detect, respond to, and suppress fires. Review staff size, position descriptions, performance standards, standard operating procedures, training, and delegations of responsibility for all personnel and staff components directly responsible for any aspect of fire protection. Determine the adequacy of fire patrols and of those aspects of facility closing procedures that are intended to prevent after hours fires. Evaluate adequacy of protection provided by interpreters during interpretive tours or programs. Evaluate the interpretive operations plan in respect to how well it incorporates fire prevention or awareness concerns into the responsibilities of interpreters. If guards or patrols are used at night, evaluate their effectiveness and the extent to which they are able to detect fires and provide or summon appropriate response.
7. Evaluate training provided to the [*site's/sites'*] fire brigade[s] and general staff fire protection awareness programs provided at the [*site/sites*]. Determine whether the right staff are being trained. Determine the extent to which training requirements of NPS-58, Structural Fire Guideline, Chapter 7, are being met. In particular, examine training in the use of hand-held fire extinguishers and fire hoses.
8. Evaluate fire suppression policies and procedures, including standard operating procedures, delegations of authority, and memoranda of understanding with local fire and emergency agencies for fire inspection or suppression services. Memoranda must comply with NPS-58 and with applicable federal regulations.

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

9. Evaluate pre-fire planning and the extent to which such planning is in accordance with NPS-58, Chapter 6. In particular, examine whether pre-fire planning takes into account the special needs of museum objects, records, exhibits, storage areas, and work spaces, as noted on pages 1 and 3 of Chapter 6. Also determine whether pre-fire planning strikes a proper balance between protecting museum resources and the structures housing them. [When historic structures are involved, you may wish to strengthen this paragraph by adding the issue of protecting historic structures themselves.]
10. Determine quality of the structural fire inspection programs and extent of compliance with NPS-58, Chapter 5.
11. Evaluate the timeliness, effectiveness, and accuracy of post-fire investigation and reporting. Evaluate reporting in terms of requirements set forth in NPS-58, Chapters 11 and 12.
12. [This paragraph is needed only when historic structures are to be surveyed.] All recommendations for improvements to or replacements of systems and hardware will take into account and be sensitive to the historic nature of the structure[s]. As appropriate, alternative recommendations for equipment and/or installation techniques will be made to allow for maximum preservation of historic fabric.
13. Observe and comment on other fire protection problems that may be noted during the survey[s]. Evaluate park policies and documentation for all fire prevention, detection, and suppression procedures not otherwise specified above.

Standards

The following published documents must be considered the standards against which Contractor shall evaluate security at the site[s]. The first [qty] items are available for loan to Contractor upon request. The remaining items are standard industry publications which should already be available to Contractor.

[Here list relevant documents, such as: NPS Museum Handbook, Part I; NPS-28, Cultural Resources Management Guideline; NPS-58, Structural Fire Guideline; NPS Management Policies; Special Directive 80-1 and NPS Checklist for Preservation and Protection of Museum Collections; and any other NPS documents that may be relevant. List National Fire Protection Association (NFPA) and Factory Mutual (FM) guidelines; fire protection industry publications.]

Products, Deliverables, and Performance

1. Contractor should discuss his/her findings and recommendations with administrative and resources management staff at [the/each] site during the initial visit[s], and is encouraged to also discuss recommendations for corrective actions. Contractor has an ethical obligation to verbally point out serious protection weaknesses as they are encountered, if such weaknesses could, in his/her judgement, result in imminent loss of park resources.
2. Contractor shall prepare and submit a written report of survey [for each site visited]. The report shall present findings and recommendations for each applicable subject listed above in the Scope of Work and shall be organized in a logical, easily comprehended manner. [The/Each] report shall include an executive summary, a discussion of observations and problems (organized according to areas within [the/each] structure or according to each fire protection issue, e.g., training, staffing,

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

hardware), a list of recommendations and possible alternative solutions for problem areas, a comprehensive prioritized list of recommendations, a list of recommended suppliers of fire protection hardware and systems and cut sheets or other manufacturer's literature on recommended hardware or system components, and a bibliography of recommended readings on the specific protection problems and solutions presented in the report[s].

3. Submit draft reports to the park according to the schedule below. Reports will be reviewed promptly and returned with comments. Contractor will be expected to incorporate each comment into the report or be prepared to explain why doing so is not appropriate.
4. After approval of the second draft, return to [the/each] park for a followup visit. Orally present findings and recommendations to the assembled park staff. Orally respond to questions, comments, and concerns from the staff. [The/Each] presentation[s] should include a walk-through of the surveyed [facility/facilities] as necessary to make findings and recommendations clear. In order to ensure sufficient time for the presentation[s], [it/they] should be scheduled to allow for one-half day [per site].

Time for performance is [number of months]. [The] Initial site visit[s] must be completed within [number of days] from award of contract. The final report must be completed within [number of days] after completion of the initial visit[s]. [The following schedule of completion is suggested. Modify as instructed by your contracting officer.]

<u>Work Element</u>	<u>Completion Time After Award</u>
Initial site visits	[number of days]
Submit first draft of report[s] to park	[number of days]
Correct report[s] by Contractor	at contractor's discretion
Submit second draft of report[s] to park	[number of days]
Correct report[s] by Contractor	at contractor's discretion
Followup site visit[s] and present report[s] to park staffs	[number of days]
Complete final report[s]	at contractor's discretion
Submit final report[s] to park	[number of days]

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

Schedule of Partial Payments

Partial payments will be made upon successful completion of each successive phase of the work, as outlined below:

Initial site visit[s]	50%
Submit second draft[s] of report[s]	25%
Submit final report[s]	25%

Inspection and Acceptance

The [Insert Name and Title] shall serve as the Contracting Officer's Technical Representative (COTR) on this project. The COTR is empowered to inspect and evaluate all work of this Contract for compliance with terms of this Scope of Work Statement.

Acceptance of the work of this contract and any changes to the terms of this contract shall be made in writing only by the Contracting Officer.

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

NATIONAL PARK SERVICE

[Park's Name]

To: All Park Personnel

From: Superintendent

Subject: Opening and Closing Procedures for [Structure's Name]

Purpose: To establish responsibilities for security and daily opening and closing procedures of [Structure's Name].

Policy: Park personnel assigned to [Structure's Name] will follow established guidelines to ensure proper security of the site and protection of the resource.

Guidelines:

The intrusion detection system will be activated during all non-business hours. Generally this is from 4:30 PM to 7:30 AM daily. Hours may vary slightly on weekends.

On days when it is not open to the public, the Curator is responsible for arming the intrusion detection system at the end of the workday. On days when the furnished historic structure is open to the public, it is the responsibility of the interpretive staff to arm the system. Generally the furnished historic structure is open on weekends and [days] during the summer.

Each morning, it is the responsibility of the Park Ranger staff to disarm the intrusion detection system. The guards on duty will turn off the systems during the early morning patrol at about [Time].

It is the responsibility of the Curator and custodian to maintain security on days when the house is not open to the public. Exterior doors should remain locked at all times and the house should be secured and alarmed at the end of each workday.

It is the responsibility of the Interpretive staff to secure the structure on weekends and on other days that the furnished historic structure is open to the public. The closing procedures should include inspecting the entire furnished historic structure, not just the areas used by the public.

The evening ranger patrol will include an inspection to ensure that the structure has been properly secured. Before entering, the park ranger will patrol around the exterior of the furnished historic structure shining the flashlight on each of the windows to ensure that they are closed. Only if all appears secure, will the ranger enter the structure alone to complete the inspection.

Closing Procedures:

The following steps are taken by designated interpretive or museum staff. As you walk through the house, note maintenance or safety concerns or questions about museum object security.

1. Ensure that visitors are out of the house. Record tour and visitation statistics when the house has been open to the public.

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures

2. Place the moveable "entrance" signs inside the Conservatory when the house has been open to the public.
3. Lock all exterior doors. Exterior doors are located in:
 - Conservatory (2 doors)
 - Front entrance
 - Atrium or Small Conservatory
 - Den
 - Kitchen Pantry Hall
 - Servants' Hallway
4. Close all windows and fasten those that can be locked. Check windows in the Conservatory and on all three floors of the house.
5. Pull down the window shades as you check each window.
6. Put the two tripods with fire detectors in their proper position in the Foyer and the Dining Room. Poles should be extended so the detector heads are as close to the ceiling as possible.
7. Close the following interior doors:
 - Front double doors (dead-bolted top & bottom & chained)
 - Basement electrical room
 - First floor Servants' Hall door to Basement
 - Second floor hall door between Servants' Wing and Staircase
(Intrusion alarm does not arm properly if they are open.)
 - Basement Furnace Room
 - Third floor door to Attic stairs
8. Close the following interior doors, if possible:
 - All basement room doors except fire control panel room
 - Both doors to China Storage area
 - Servants' Hall door to Front Foyer
(NOTE: Closing these doors reduces the chances for false alarms.)
9. Leave night lights on in the following areas:
 - Laundry Room, above the sinks
 - Kitchen, above the sink
 - Servants' Hall, above the radiator
 - Dining Room, one light on each of the two sconces
 - Entrance Hall, inner chandelier globe. **(NOTE:** The switch is in closet.)
 - Second floor Servants' Hall staircase
10. Activate the two intrusion detection system panels in the Laundry Room. Remember the Servants' Wing exit must be closed before the system is armed. Exit the house through the Servants' Wing door.
11. Make a final patrol around the outside of the house to check doors and windows. Do not jiggle doors or windows from the outside. (Doing so might cause an intrusion alarm.)

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures (continued)

Opening Procedures:

Intrusion detection systems are disarmed each morning by the park ranger staff. The systems will be off prior to the time that other park staff need to enter the house.

1. Before entering, walk around the outside of the house and check for signs of entry. If anything looks suspicious do not enter. Report the observation to the protection staff immediately.
2. Enter through the Servants' Wing door. Lock the door behind you.
3. Check the status lamps and alarms on both alarm system panels in the Laundry Room and report any malfunctions.
4. Make a walk-through visual inspection of the entire house, including the basement and upper floors. Make particular note of signs of attempted entry, safety or maintenance needs, and the location of museum objects. Report concerns or problems to the appropriate protection or museum staff.
5. Take down the two portable fire detectors in the Foyer and Dining Room, when the house is open to the public. Place them in the Hall Closet.
6. Prepare the rooms along the tour route by opening shades and turning on the appropriate lights, if the house is to be open to visitors. Make a special note of safety and security concerns in these visitor use areas.
7. Prepare for greeting visitors by placing the entrance signs outside. Establish tour assignments, prepare the visitor statistic sheet and ensure that a supply of park folders is available.
8. In summer, when temperatures are hot, visitors will enter through the front door. When weather is cool, the Conservatory will be opened as a waiting area for visitors. If the Conservatory is to be opened, clean up the room, place literature out on display, and unlock both exit doors from the room.
9. Call the Park's Visitor Center desk to let them know that the house is ready for visitors and to check for any special tours or activities.
10. Throughout the day, be certain that all doors into the house are locked unless you can observe them. Generally, the only doors that should be unlocked during the day are those in the Conservatory when it is being used as a visitor waiting area.

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures (continued)

NATIONAL PARK SERVICE

[Park's Name]

To: All Park Personnel

From: Superintendent

Subject: Opening and Closing Procedures for [Storage Facility's Name]

Purpose: To establish responsibilities for security, fire prevention and daily opening/closing procedures for the park's museum collection storage facility.

Policy: Park personnel who are assigned responsibility for the park's museum collection are required to follow the established guidelines to ensure the proper security of the site and protection of the resources.

Guidelines

Opening Procedures:

1. Before entering the facility, check for any unusual circumstances (e.g., signs of illegal entry, vandalism or maintenance problems). If anything looks suspicious **DO NOT ENTER**. Report any problems to the appropriate staff person in law enforcement, maintenance and/or supervisor immediately.
2. Unlock exterior doors. Turn off the intrusion detection system.
3. Turn on museum workspace lights.
4. Unlock collection storage space door (when needed) and turn on lights.
5. Inspect museum workspace and collection storage space for unauthorized entry, fire hazards, or other unusual happenings (such as roof leaks, fire suppression system leaks, pests, and damaged objects).

Closing Procedures:

1. Inspect the collection storage space to be sure all museum objects and associated records are returned to their proper locations; dust covers are in place; all storage cabinets are closed and locked, and that all tools, equipment, reference books have been returned to their proper places.
2. Check that all museum storage cabinets that were used during the day are locked. Return all storage cabinet keys to keybox and secure it.
3. Check the workspace and collection storage space to be sure that all staff or any other persons are out of the facility.
4. Turn off lights. Make sure that collection storage space door is locked.
5. Turn off all computer equipment, other electrical equipment, and lights in adjacent office spaces.
6. Lock windows in office spaces.
7. Turn on the intrusion detection system.
8. Lock exterior doors.

Figure G.4. Sample Museum Collections Storage Opening and Closing Procedures

NATIONAL PARK SERVICE

[Park's Name]

To: All Park Personnel
From: Superintendent
Subject: Museum Collection Access Policy and Procedures

Purpose: To establish park policy and procedures for access to the museum collection. It is the policy of the National Park Service, and of [Name of Park], that its natural and cultural resources shall be made available for educational and research purposes, as long as this access doesn't:

- endanger the item's preservation and security
- conflict with Federal legislation (such as the Copyright Act, the Freedom of Information Act) or state legislation (such as privacy and public laws)

NPS museum collections possess internal administrative importance, as well as importance to educational, research, and publishing communities both inside and outside the Service. Protecting these valuable resources, while making them available to the widest possible audience, requires the park museum staff to manage access to the museum collection.

Times of Operation: Normal hours of access to the park's museum collection are [Days and Hours].

General Access Procedures:

1. Except as otherwise noted, this written procedural statement applies equally to museum objects, archival and manuscript materials, museum collection records, and information about such park resources prepared by the staff in the course of their official duties.
2. Access to objects in the collection, to storage cabinets and exhibit cases, and to keys to locks on storage rooms, storage cabinets, and exhibit cases, will be strictly controlled by the Superintendent or designee. These areas shall be designated as secure areas, and except for emergencies, access shall be limited to authorized park staff. Park staff are discouraged from routinely using museum storage space as work or reference room space.
3. Only those persons authorized in writing by the superintendent (authorized park staff) will be permitted unaccompanied access to secure areas, including museum storage, work, and reference/study room spaces, under normal conditions. All other persons must be accompanied by authorized staff while in a secure area. In an emergency, designated emergency response personnel may have access to secure areas in accordance with the provisions of the park's Emergency Operations Plan. An authorized person will continuously supervise anyone in a secure area who is not on the list of authorized park staff.
4. Granting of access to a secure area does not automatically include access to museum objects, archival materials, or museum records kept in those areas. Only persons with a legitimate need to use collection items will be granted access to them.
5. Anyone requesting access to secure areas or to museum collections must agree to comply with the provisions of the park's "Conditions for Access to Museum Collections."
6. These procedures will be reviewed every two years and revised as necessary.

Figure G.5. Sample Park Museum Collection Access Policy and Procedures

Eligibility for Access to Museum Collections:

Access to the collections should be granted by the Superintendent or designee to the following individuals:

1. **Individuals seeking to use collection for research or study.** An individual may request to conduct research on the collection by registering and making an appointment with the park museum staff.
2. **National Park Service staff from the Field Area Office, System Support Office, the Washington Office, centers, or other parks who are visiting the park on official business.** The nature of their work must require them to evaluate, inspect, or work with the collections or the rooms, cabinets, or cases housing the collections or with park records on the collections. Persons granted access under this category of eligibility do not necessarily have to be accompanied by park staff at all times; a decision in that respect will be based on their reasons for needing access and on other factors that the Superintendent may consider germane at the time.
3. **Representatives of Indian Tribes or Native Hawaiian organizations having official business with the park staff for examining archeological or ethnographic objects in the collections.** The Superintendent should ascertain if the individuals are official tribal representatives. Under this category, individuals will have access to collections associated with their own tribes.
4. **Non-museum park employees, including volunteers, who are being oriented to the park and their work or who require access to collections as part of their internal training.**
5. **Park maintenance and protection staff in the performance of their official duties.** Except in the most unusual circumstances, such personnel shall have access only to rooms in which collections are kept, not to storage cabinets or exhibit cases or to key boxes or other places where keys to cabinets and cases are secured. As provided below, other means shall be made available to these personnel for emergency access. Persons granted access under this item of eligibility do not necessarily have to be accompanied by curatorial staff, but should be whenever possible.
6. **Individuals or representatives of organizations, institutions, or corporations desiring to use objects or records in the collection for commercial or publicity purposes.** Such persons must satisfy the Superintendent that their purposes are legitimate and that the proposed uses are in keeping with park purposes and the NPS mission and will not reflect adversely on the park, the National Park Service, or a Native American tribe, if the request is for tribal materials. Access should not be granted solely on the grounds that access to the park's collection would be more economical or "easier" for them than access to another collection. When the park provides access, it is not authorizing publication, distribution, derivative works, exhibitions, reproductions, or other non-research activity.
7. **Employees of construction or service companies who require access to collection storage or exhibit areas in order to service or maintain the building or its utilities, including alarm systems.** Such persons will be allowed access only under the terms of a contract or purchase order issued by or for the park and only to those areas where they are supposed to work. Under no circumstances shall such persons be allowed unsupervised access to objects kept in storage

Figure G.5. Sample Park Museum Collection Access Policy and Procedures (continued)

cabinets and exhibit cases. Except as may be otherwise provided in the language of the contract or purchase order, all persons granted access under this item of eligibility must be accompanied at all times by authorized staff. The Superintendent or designee shall have the authority to restrict access otherwise granted by this paragraph, under such circumstances where it is deemed advisable.

8. **Other persons or groups of persons may be allowed limited access to the collections, on determination by the Superintendent or designee that such access will be to the mutual benefit of the persons or groups and the park.** Examples of circumstances to which this item of eligibility might apply include: tours for school classes, tours for members of museum organizations or historical societies, tours for families of park employees, orientation for local political/governmental officials, orientation for visiting Park Service employees not on official business, and tours for non-NPS museum personnel, teachers, and prospective researchers who are considering applying for permission to use or view the collection.

Figure G.5. Sample Park Museum Collection Access Policy and Procedures (continued)

**U.S. Department of the Interior
National Park Service**

CONDITIONS FOR ACCESS TO MUSEUM COLLECTIONS

1. Access to collections and/or to a secure area by researchers is by appointment. Any limitations imposed on access due to collection conditions, staff availability, and security considerations must be imposed equally on all users, including park staff's personal research. Persons needing to have access are urged to make their requests known to the Superintendent or designee as far in advance as possible.
2. Prospective visitors should be aware that the park staff is extremely busy at certain times of the year and that authorized staff may not be available to assist them at those times. Accordingly, it is suggested that persons needing access make an appointment and be prepared to discuss alternative times with the staff when they submit their requests.
3. The park's decision to allow access may depend upon the condition of the materials, the availability of space for the requester to work, and appropriate supervisory staff. The park keeps space and staff available for visiting researchers.
4. The park requires registration of all researchers (including those inquiring through the mail, on the phone, or Internet). Registration information needs to include full name, address, telephone number(s), institutional affiliation, research topic and publication plans. This information must be updated yearly to remain valid. A valid picture identification card must be shown at the time of the visit. All materials requested by the user are recorded.
5. All non-staff visitors and all staff visitors who are not designated as authorized staff will be accompanied at all times by authorized staff when in museum collection storage areas, when working in open exhibits, or when working with original museum and archival materials.
6. All visitors must sign in and out of museum collection storage area(s) and reference/study rooms on the park's "Visitor Log."
7. Smoking, drinking, and eating are prohibited in collection storage and work spaces and reference/study rooms. Suitcases, briefcases, overcoats, plants, and animals, except guide dogs, are not allowed in collection storage and study areas. Researchers must use pencils/paper or portable computers for taking notes.
8. All guidelines for handling objects and archival and manuscript materials must be read and signed by all collection users, whether staff or non-staff. These guidelines are published separately and may be requested in advance of a visit. A copy of the guidelines also will be provided to each user at the time he/she arrives.
9. The park reserves the right to the following as a condition for granting access to the collections:
 - a. The researcher must agree to abide by any copyrights and state privacy and publicity legislation as well as duplication, publication, and citation policies.
 - b. The park, as a courtesy, requests two copies of completed research papers; publications; CD-ROMs; screen captures of World Wide Web work, derived from work on the collections, or which contain photographs of objects in the collections or copies of documents in the archival collections. Copies of formal reports and other published materials shall be provided at the researcher's expense. Copies of drawings, photographs, and other products of research shall be provided at the researcher's expense, except when doing so constitutes an economic burden, in which case the Superintendent can elect to defray those costs or waive the requirement for the researcher to provide the materials.

Figure G.7. Conditions for Access to Museum Collections

MEMORANDUM OF UNDERSTANDING

BETWEEN

[Name of Park]

and

[Name of Fire Company]

[City, State]

Article I
Background and Objectives

WHEREAS, [Name of Fire Company] hereinafter [Department/Company] and the National Park Service (hereinafter Service) and more particularly the [Name of Park], hereby enter into an Agreement to provide mutual aid and assistance for occurrences of structural fires, *[As applicable, insert language to identify other needs, such as wildfires, emergency medical services and hazardous materials spills for those occurrences]* on or within the boundary of said Park, a unit of the National Park System, United States Department of the Interior, that are within the response area of the [Name of Fire Company]; and

WHEREAS, pursuant to 16 U.S.C. 450bb, the Service administers the Park that was established as a unit of the National Park System, United States Department of the Interior; and

WHEREAS, pursuant to 16 U.S.C. 1b.(1), the Service may provide for the rendering of emergency rescue, fire fighting and cooperative assistance to nearby fire prevention agencies and for related purposes outside of the National Park System; and

WHEREAS, pursuant to 42 U.S.C. 1856a, the Service is authorized to enter into reciprocal agreements for mutual aid to furnish fire protection with any fire organization maintaining fire protection facilities in the vicinity of Service property and for other property for which said agency normally provides fire protection; and

WHEREAS, the Service and Company have determined that the Memorandum of Understanding herein described is compatible with the public interest.

NOW, THEREFORE, pursuant to 42 U.S.C. 1856a, both parties do mutually understand and agree as follows:

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company**

Article II Statements of Work

The Memorandum of Understanding (MOU) herein made is subject to the following terms and conditions:

General

(1) The purpose of this MOU is to provide mutual aid and assistance between [Name of Park] and the [Name of Fire Department/Company] of [Name of city or county and state], should emergency medical services be needed in structural fires [*as applicable, include wildfires or hazardous materials spills*] that occur on, or threaten or endanger property under the protection of either agency.

(2) The area of Park property covered by this MOU will be that area within the [Name of Fire Department/Company] response area of [Name of city or county and state].

(3) In the execution of this MOU, employees or agents of the company are not considered employees of the park or NPS.

(4) The Service, Park and the [Department/Company] waive all claims against each other for compensation for any loss, damage, personal injury, or death occurring in consequence of activities pursuant to this MOU.

(5) All structural fire suppression personnel will meet, as a minimum, the requirements found in NPS-58, Structural Fire Guidelines.

(6) The Park and [Department/Company] agree to notify the other of available training the areas identified in No. (8) below and participate in joint training exercises when possible.

(7) Park and Company representatives will meet Quarterly (January, April, July, October) to discuss mutual aid operations and to evaluate the MOU for revisions and renewal. Any revisions of this Agreement must be in writing, receive proper approval, and be signed by the parties hereto. Renewals will be subject to regulations existing at the time of renewal and such other terms and conditions deemed necessary to protect the public interest.

(8) The provisions of this MOU are divided into the following sections: Structural Fire; [*as applicable, include other sections, such as Wildfire (Forest Fire); Emergency Medical Service/Search and Rescue; and Hazardous Materials.*]

Structural Fire

(1) As an aid to implementing this MOU, selected members of the [Department/Company] (including the Fire Chief and the Ambulance Chief) will, at least annually, visit the Park and, accompanied by the Park Superintendent or designated representative, survey park buildings for the purpose of developing a Building Pre-Plan. Special fire fighting procedures necessary to safeguard museum objects and archival and manuscript collections housed within the structure will be identified in the Building Pre-Plan. Current floor plans of Park buildings will be provided to the Company Fire Chief.

Figure G.8. Sample Memorandum of Understanding Between a Park and a Fire Company (continued)

(2) The Company will respond to all reported structural fires in the Park (within the [Department's/Company's] response area) as promptly as possible and with due regard for the safety of all persons. Upon arrival at the scene of the reported structural fire:

(a) *Park Ranger not at the scene.* The Officer-in-Charge for the [Department/Company] will check the perimeter of the building for signs of fire. If sign of a fire is detected, he/she will assume direction of all fire fighting activities until relieved by a superior officer or until the fire is extinguished and declared out. If no sign of a fire is detected, he/she will wait for arrival of a Park Ranger.

(b) *Park Ranger at the scene.* If the ranger has already checked the structure for sign of fire and the alarm system, he/she will so advise the Officer-In-Charge of the [Department/Company]. If not, the ranger and the Officer-In-Charge will jointly check the structure for sign of fire. If sign of a fire is detected, the Officer-In-Charge for the Company will assume direction of all firefighting activities until relieved by a superior officer or until the fire is extinguished and declared out. If the structure has been identified in the Building pre-Plan as requiring special precautions necessary to safeguard museum objects and archival and manuscript collections within the structure, the ranger will so notify the Officer-In-Charge. The ranger will notify the officer-in-charge of any hazardous materials in the collection (such as cellulose nitrate film).

(3) Each party to this MOU will furnish such equipment and personnel to aid the other party with a structural fire as can be made without jeopardizing the fire protection of its own area of responsibility.

(4) All requests for Park Aid to assist with a structural fire must originate from the Company's senior fire official at the scene of the fire to the Park Superintendent or designated representative.

[As appropriate, include language on wildfire (forest fire), emergency medical service/search and rescue, and hazardous materials.]

Article III Term of Memorandum of Understanding

The Memorandum of Understanding hereby made shall terminate one (1) year from the effective date hereof, at noon, [Name of State] time, unless prior thereto it is relinquished, abandoned, or otherwise terminated pursuant to the provisions of this MOU or of any applicable Federal law or regulation. In addition, the MOU will expire at the end of the specified term unless formally reaffirmed or rewritten if necessary. The effective date of this MOU shall be the date of its execution by the Superintendent, [Name of Park].

Unless relinquished, abandoned, or otherwise terminated pursuant to the provisions of the MOU or of any applicable Federal law or regulations, the MOU will be considered for renewal.

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company (continued)**

Article IV Key Officials

This Memorandum of Understanding is subject to the conditions of the Superintendent or representative, and shall comply with the regulations of the Secretary of the Interior and other applicable conditions as outlined herein.

Superintendent
[Name of Park]
[Complete Address]

The President and Fire Chief of *[Name of Fire Department/Company]* will direct operations according to the conditions agreed to in this MOU.

[Name of President]
[Name of Department/Company]
[Complete Address]

[Name of Fire Chief]
[Name of Department/Company]
[Complete Address]

Article V Reports

Each party is responsible for its respective timekeeping and other required records and reports.

Article VI Termination

This Memorandum of Understanding may be terminated upon breach of any of the conditions herein or at the discretion of either party. Termination shall be done by providing ninety (90) days written notice to the other.

Article VII Required Compliance

All activities pursuant to this Memorandum of Understanding shall be in compliance with the requirement of Executive Order 11246, as amended; Title VI of the Civil Rights act of 1964 (78 Stat. 252; 42 U.S.C. 2000d et seq.); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, national origin, handicap, religion, or sex in employment and in providing facilities and services to the public.

No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

Figure G.8. Sample Memorandum of Understanding Between a Park and a Fire Company (continued)

This Memorandum of Understanding is subject to the provisions of 18 U.S.C. 1913, which provide:

No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or oppose, by vote or otherwise, any legislation or appropriation by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communicating to Members of Congress on the requests for legislation or appropriations which they deem necessary for the efficient conduct of the public business.

Whoever, being an officer or employee of the United States or of any department or agency thereof, violates or attempts to violate this section, shall be fined not more than \$500 or imprisoned not more than one year, or both; and after notice and hearing by the superior officer vested with the power of removing him, shall be removed from office or employment.

Nothing contained in this Memorandum of Understanding shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress for the purposes of this Memorandum of Understanding for that fiscal year, or as involving the Service in any contract or other appropriation for the further expenditure of money in excess of such appropriations.

IN WITNESS WHEREOF, the Superintendent of [Name of Park], acting on behalf of the National Park Service, in the exercise of the delegated authority from the Secretary of the Department of the Interior, has caused this Memorandum of Understanding to be executed this [Date] day of [month], [year].

[Name of Superintendent or Manager]
[Name of Park or Center]

ACCEPTED THIS [Date] DAY OF [Month], [Year].

[Name of Fire Department/Company]

[Name of Fire Chief]
[Name of Fire Department/Company]

Figure G.8. Sample Memorandum of Understanding Between a Park and a Fire Company (continued)

APPENDIX H. CURATORIAL HEALTH AND SAFETY

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APPENDIX H. CURATORIAL HEALTH AND SAFETY

A. LAWS, REGULATIONS, AND NPS POLICIES AND GUIDELINES

Special Directive 83-7 (Revised 1984), National Park Service Safety and Occupational Health Management Policy, states "it is the policy of the National Park Service to provide and maintain a safe healthful work environment." The NPS Occupational Safety and Health Program has been developed around the concepts of loss control management. This program is based on the following authorities and guidelines:

- The Occupational Safety and Health Act of 1970 - provides the requirements on which each Federal Agency's safety and health program is based.
- The Comprehensive Drug Abuse Prevention and Control Act of 1970 - establishes the mechanisms for reducing the availability of controlled substances and the procedures for bringing a substance under control.
- The Resource Conservation and Recovery Act (RCRA) of 1986 - directs the Environmental Protection Agency to develop and implement a program to protect human health and the environment from improper hazardous waste management practices.
- Executive Order 12196 (1980)- directs each Federal Agency to provide a safe and healthful working environment for its employees.
- 29 CFR 1910.1000, Subpart Z - provides tables listing toxic and hazardous substances and maximum exposure levels.
- 29 CFR, Part 1910.1200 (Revised 1987) - provides specific guidance on implementing the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard.
- 29 CFR 1910.1450 (Effective 5/1/90) - provides guidance relevant to occupational exposure to hazardous chemicals in laboratories.
- 29 CFR 1910.1047 (Revised 1985) - regulates the use of the fumigant ethylene oxide.
- 29 CFR 1960 - provides basic program direction for Federal Employee Occupational Safety and Health Programs.
- The Department Manual, Part 485- establishes the Department of the Interior (DOI) safety and health program.
- NPS-14, Cave Radiation Safety and Occupational Health Guideline - provides guidance on establishing precautionary procedures for cave radiation in order to minimize potential health hazards.

- NPS-50, Loss Control Management Program Guideline - provides guidance on the procedures for a park's health and safety program.
- NPS-77, Natural Resources Management Guideline, Chapter 2 - provides an overview of the integrated pest management concept and of NPS and Departmental policies concerning the use of pesticides, and procedures for applying for approval to use pesticides.

B. SOURCES OF ASSISTANCE

1. The Federal agencies that regulate aspects of the National Park Service health and safety program are as follows:
 - Occupational Safety and Health Administration (OSHA) - publishes and enforces safety and health regulations for most businesses and industries in the United States.
 - National Institute for Occupational Safety and Health (NIOSH) - trains occupational health and safety professionals; conducts research on health and safety concerns; and tests and certifies respirators for work place use.
 - Environmental Protection Agency (EPA) - administers laws to control and/or reduce pollution of air, water, and land systems; regulates use and labelling of pesticides in accordance with the Insecticide, Fungicide and Rodenticide Act of 1972.
 - Department of Transportation (DOT) - regulates the labeling and transportation of hazardous materials.
2. In addition to the above Federal agencies, park staff should be aware of the following professional organizations that are involved in health and safety management:
 - The American Conference of Governmental Industrial Hygienists (ACGIH) develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

American Conference of Government Industrial Hygienists
6500 Glenway Avenue, Bldg. D7
Cincinnati, OH 45211
513-661-7881
 - The National Fire Protection Association (NFPA), a voluntary membership organization, promotes and improves fire protection and prevention. The NFPA publication Standard No. 704, "Identification of the Fire Hazards of Materials," rates the hazard of a variety of materials during a fire.

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269
617-770-3000
 - The National Safety Council educates and influences people to adopt safety and health policies, practices and procedures to prevent losses caused by accidents and hazardous occupational or environmental exposures.

National Safety Council
444 North Michigan Avenue
Chicago, IL 60611
312-527-4800

- The American National Standards Institute (ANSI), a voluntary membership organization, develops consensus standards nationally for a wide variety of health and safety devices and procedures.

American National Standards Institute
1420 Broadway
New York, NY 10018
212-354-3300

3. In addition to the Park Safety Officer, the Regional Safety Officer, the Regional Curator, and the WASO Safety Services Division, the following organizations have extensive experience in dealing with occupational health and safety issues/problems in the workplace, including museum work environments:

Center for Occupational Hazards (COH)
Dr. Michael McCann
5 Beekman Street
New York, New York 10038
212-227-6220

Arts, Crafts and Theater Safety (ACTS)
Ms. Monona Rossol
181 Thompson Street, No. 23
New York, New York 10012
212-777-0062

C. COMPARISON OF TYPES OF VENTILATION SYSTEMS

The advantages and disadvantages of the two types of ventilation systems - dilution ventilation and local exhaust ventilation - are illustrated in a chart on page 25 of Ventilation, A Practical Guide. This book, listed in Chapter 11, Section H, is available from the following source:

Center for Occupational Hazards (COH)
5 Beekman Street
New York, NY 10038
212-227-6220

A copy of this chart should be inserted in this section.

D. SOURCES OF HEALTH AND SAFETY EQUIPMENT AND SUPPLIES

There are several sources for obtaining desk fans, fume hoods, portable fume hoods and fume scrubbers, laboratory protective clothing and gloves, respirators, chemical storage cabinets, health and safety publications, hazard warning labels, signs, and charts, and other supplies. NPS parks and centers should contact the Curatorial Services Division, Washington Office, for a copy of a list of sources for health and safety equipment and supplies.



E. LIST OF FUMIGANTS USED IN MUSEUMS

The Center for Occupational Hazards (COH) has prepared a chart that lists some of the common fumigants used in museums. This chart is available in the data sheet, "Safe Pest Control Procedures for Museum Collections by Perri Peltz and Monona Rossol. The chart titled "Hazards of Fumigants" lists the registered name, synonyms, trade names, appearance and warning properties, important health information, and reactivity information for the fumigants: carbon disulfide, carbon tetrachloride, dichlorvos (Vapona®), ethylene oxide, hydrogen cyanide, methyl bromide, naphthalene, para-dichlorobenzene, and sulfuryl fluoride (Vikane®).

Health related information in the chart includes: OSHA/ACGIH standards, routes of entry, signal word, acute health effects, chronic health effects, carcinogenic effects, and reproductive effects. Reactivity information relates how each fumigant reacts with the material fabric of objects.

A copy of this chart should be obtained from the below source and inserted in this appendix.

Center for Occupational Hazards (COH)
5 Beekman Street
New York, NY 10038
212-227-6220

APPENDIX I. CURATORIAL CARE OF ARCHEOLOGICAL OBJECTS

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APPENDIX I. CURATORIAL CARE OF ARCHEOLOGICAL OBJECTS

A. THE NATURE OF ARCHEOLOGICAL MATERIALS

Any object that has been recovered from an archeological site is considered archeological material. This appendix only provides guidance only on the care of objects excavated from the ground. Care of collections from wet sites or marine excavations is not addressed. For guidance in these areas, consult an archeological objects conservator with field experience in the treatment of wet materials.

Depending on the soil and climate characteristics of the site, a wide variety of organic and inorganic objects may be recovered from an archeological excavation. These materials include inorganic materials such as metal, ceramics, glass and stone; and more infrequently, organic materials such as leather, basketry, and textiles. In addition, historic archeology has brought modern plastics and synthetics into archeological collections. Non-artifactual objects or "ecofacts", such as botanical material, pollen, phytoliths, oxylate crystals, snails, insect remains and parasites, are increasingly collected as a result of archeological research designs.

Because the research value of archeological material may be compromised or destroyed by unnecessary handling and inappropriate treatment, preservation of these materials should be based on preventive care. Careful handling, packaging and storage of archeological objects are crucial for the survival of the material as an "artifact" rather than as a mass or lump of stable compounds produced by the ongoing processes of deterioration.

The condition of all these objects depends directly on how the materials have reacted to the environmental conditions to which they have been exposed. Archeological materials have been exposed to complex environmental variables. First, the object in an underground context reaches a certain equilibrium with the surrounding soil. Then, when the object is excavated, it must adjust to an entirely new set of environmental conditions. Reactions to both events involve physical and chemical changes. Depending on how the material has reacted or equilibrated to a particular underground context, the object, at the moment of excavation, may be extremely fragile, or quite well-preserved. At the time of excavation, the object also can be particularly vulnerable to rapid deterioration. Figure I.1 illustrates the deterioration rate of archeological objects through time according to the episodes that encourage deterioration of the material.

C. CLEANING ARCHEOLOGICAL OBJECTS

Cleaning of archeological material by archeologists, curatorial staff, and even by conservators, should be kept to the lowest level necessary to achieve a valid goal. It is important to note that any cleaning method, no matter how simple, is irreversible and may destroy important archeological evidence. Surface decorations and composite or associated materials often exist only as impressions on the surface of the object or in the surrounding soil. Original surfaces of metal objects may actually lie within layers of corrosion. Moreover, evidence of use (e.g., food residue in containers, pigment traces on stone palettes, or blood traces on stone projectile points) may be destroyed by unnecessary or inappropriate cleaning. Cleaning also may interfere with the application of scientific methods of analysis. For example, the use of acid to remove dirt deposits on ceramics also may remove acid soluble compounds in the ceramic paste, thereby invalidating composition analysis often used for determining the prehistoric source of clay. Even washing ceramics in water may remove water soluble material that was part of the original clay paste. Water washing will remove amino acid traces now used to date bone. Wet cleaning may also encourage deterioration of salt contaminated material and can be disastrous to metal objects when not followed by complete and controlled drying.

The above examples demonstrate the importance of minimal intervention in the treatment of archeological materials. Because the rapid advance of technology makes accurate assessment of the research potential of archeological objects difficult, any treatment that alters the chemical or physical integrity of these objects should be avoided whenever possible. Even traditional treatments previously considered "routine," such as washing, should be reevaluated in terms of the real necessity of treatment versus the danger of loss of information and possible irreversible damage to the object.

Therefore, at the level of curatorial care, it is best to avoid washing procedures altogether, and to remove only loose dust and dirt by dry brushing or controlled vacuuming. Remember that the surface of archeological objects is often fractured, friable or otherwise easily dislodged by rubbing or application of pressure. As a general rule, carefully assess the object's surface before starting any cleaning procedure. If the archeological significance, present condition, and intended use of the object require treatment beyond brushing away loosely adherent dirt, additional cleaning, stabilization, or repair should be conducted only by or with the advice of a conservator experienced in the treatment of archeological material.

D. PREVENTIVE CARE: ENVIRONMENTAL REQUIREMENTS

Because archeological collections are often large and contain a variety of materials with different environmental storage requirements and with different degrees of academic significance, a systematic approach to managing these diverse collections should be taken to ensure basic preservation of all materials.

Traditional physical organization of the collections by provenience data or by cultural affiliation data may not correspond with their preservation needs. When different materials require different environments for optimum preservation, it is best to maintain the academic integrity of the collection through proper museum record keeping procedures, while maintaining the physical integrity of the collections by organizing the materials according to their environmental requirements and storing them accordingly.

Applying this preservation approach, archeological materials may be ranked in the following three categories:

1. Category I - Negligibly Climate-Sensitive Materials

a. Materials:

- stable fired ceramics and stone
- stable inorganic architectural materials (e.g., plaster, mud daub, brick, and stone)
- dry pollen, flotation, and unprocessed soil samples
- faunal remains

b. Climate Requirements: Daily and seasonal fluctuations of both temperature and relative humidity should be as gradual as possible.

- **Relative Humidity:** Above 30% and below 65%. Mold may become a problem above 65%.
- **Temperature:** Anywhere from freezing to 100°F. Moderate and cooler temperatures (below 70°F) are preferable because higher temperatures speed up rates of deterioration of all materials.

2. Category II - Climate-Sensitive Materials

a. Materials:

- stable metal
- stable glass
- worked bone, antler and shell
- botanical specimens
- textiles
- wood

- skin, leather and fur
- feathers and horn
- natural gums, resins, and lacquer

b. Climate Requirements:

Relative Humidity: A stable point determined by the object's environmental history and current regional climatic considerations. Consult a conservator for the optimum relative humidity for collections in the park's area. Assuming that the collections will be stored in the general area from which they were excavated, the following broad guidelines for relative humidity may be followed:

30-40%: Semi-arid areas and deserts

40-50%: Central and eastern plains and woodlands

45-55%: Seacoast and lakeshore

Once the appropriate RH% is determined, it is important to keep conditions as stable as possible. Many organic materials are more sensitive to fluctuations of relative humidity than to any one unchanging level in the moderate range. Keep the RH% as steady as possible, with fluctuations ideally no greater than 3% in one day. Seasonal fluctuations should be as gradual as possible, and should not exceed more than a slow 10% drift in relative humidity from summer to winter.

Temperature: Above 50°F and below 75°F. Temperature may be allowed to drift to keep relative humidity steady, but sudden changes of more than 5 degrees daily should be avoided.

3. Category III - Significantly Climate-Sensitive Materials

a. Materials:

- unstable (salt-contaminated) ceramics and stone
- unstable glass (e.g., devitrified glass that appears damp or "weeping" due to chemical alteration during period underground and the subsequent dissolution of compositional elements)
- unstable metal, particularly iron
- mummified human and animal remains
- composite objects (objects made of several different materials)

b. Climate Requirements:

Relative Humidity: These objects require a restricted range of relative humidity, and often have no tolerance for fluctuation in ambient conditions. Although the requirements of each object will be dictated finally by specific conditions, the following general guidelines apply to broad categories of significantly climate sensitive materials:

Metal: Under 30% RH. Unstable iron is best stored in conditions of below 15% RH.

Unstable glass: 30 to 40% RH.

Naturally mummified animal remains: 15 to 20% RH.

Unstable ceramics and stone (salt-contaminated):

Below 50%

Most importantly, keep the RH stable. Salts have a critical point of moisture attraction when they transform from the crystal state to the liquid state. The critical point for combined salts is lower than that of individual salts alone, and it is difficult to recommend a standard RH level for all unstable ceramics and stone. Keep the RH as steady as possible to avoid continued damage by the hydration cycling of soluble salts.

Temperature: A steady point chosen between 60-72°F. Temperature fluctuation should be minimal, but may be allowed to drift within a 2 to 3 degree range to keep relative humidity steady.

E. PREVENTIVE CARE: STORAGE OF ARCHEOLOGICAL OBJECTS

Ideally, all archeological objects should be stored in climate-controlled areas, but in reality, this often is not practical. Most archeological collections are large, and not all storage facilities can afford the luxury of having an equally large climate-controlled storage space available to house collections. In such cases, it is possible to maximize preservation while minimizing utility costs by implementing a storage strategy based on the environmental requirements of archeological materials. See Section D of this appendix for a discussion of environmental requirements. Three levels of storage corresponding to the three categories of climate-sensitivity can be established, and various storage techniques can be used to moderate extremes and shifts of environmental conditions.

1. Three Levels of Storage

a. General Storage (Category I Materials)

General storage should meet the minimum overall standards for all NPS storage spaces as outlined in Chapter 7.

Many of the materials that can be placed in general storage can be stored in boxes on open shelving. Loose material such as bulk botanical specimens, unprocessed soil samples, dry pollen and flotation samples, slag, unworked bone, lithic cores and debitage, and ceramic sherds should be bagged within the boxes. Make sure that the bag is strong enough to hold the contents without tearing or puncturing. Bags made of Tyvek®, a strong spun polyethylene plastic that permits the passage of water vapor, is a good choice for this type of material. Canvas bags and resealable polyethylene bags also can be used.

b. Climate-Controlled Storage (Category II Materials)

Storage specifications for Category II materials should comply with the optimum standards for NPS storage areas as outlined in Chapter 7. Once the climate-insensitive material is separated out for general storage, the area needed to house this category of materials may be considerably smaller and, therefore, less costly to maintain.

If there is no area available in the structure that is able to maintain a steady environment either naturally or by means of a mechanical system, consider the installation of a climate-controlled prefabricated structure for storage of climate-sensitive materials. Consult the Regional Curator, conservators specializing in environmental or preventive conservation, or the Curatorial Services Division, WASO, for guidance in developing a climate-controlled storage area.

c. Microclimate Storage (Category III Materials)

Within the climate-controlled storage area, specialized microclimates can be created for the storage of extremely climate-sensitive and unstable materials. Microclimates can be created simply by placing the object within a closed well-gasketed museum cabinet to slow down the diffusion rate of air exchange between the interior and exterior of the cabinet. If the environmental conditions in the storage area are already fairly steady as specified in Chapter 7, conditions within the case should be extremely stable with virtually no fluctuations of relative humidity.

However, the preservation of some excavated material like metals and unstable glass, depends on the maintenance of a relative humidity quite different from ambient conditions within the climate-controlled area. Microclimates for these specialized needs can be created by housing these materials in special containers with moisture sensitive materials called sorbents to dessicate, ballast or buffer the interior of the container against changes in the preferred relative humidity of the objects enclosed. All organic materials, particularly cellulosic materials such as wood, textiles, and paper, are able to condition their immediate environment by absorbing and giving off moisture to maintain an equilibrium between their own moisture content and ambient conditions. The most efficient sorbent, however, is silica gel.

2. Storage Techniques

a. Packaging with Silica Gel

Silica gel is inert amorphous silicon dioxide in a porous granular form that is able to absorb (or more precisely, to adsorb) moisture from the air. Because of its structure, silica gel is able to absorb 30-40% of its dry weight in water, and responds more quickly than other sorbents (e.g., wood, textiles, paper) to variations in relative humidity that are different from the level of moisture to which the gel has been accustomed or "conditioned". The gel rapidly senses, corrects, and stabilizes fluctuations in relative humidity by humidifying or dehumidifying the air around it to maintain its own preferred environment.

Several types of silica gel are commercially available. The particle size of gels normally used for conditioning museum exhibit and storage cases is 3-8 mesh, grades 01 or 03. Each type has characteristic adsorption capacities within certain ranges of relative humidity. For example, regular density silica gel RD03 made by W. R. Grace and Co., Davis Chemical Division, has a very high adsorption capacity below 50% and is, therefore, a good choice for creating a dry microclimate for unstable metals. Intermediate density silica gel ID59, also from W. R. Grace and

Co., has a very high adsorption capacity between 70% and 100% RH, and is much more efficient than regular density gel in buffering changes within this range. However, few objects require microclimate storage with such high and mold-threatening RH, and this gel is most often used in combination with other grades.

Art-Sorb made by Fugi-Davison Chemical, Ltd., is a silica gel in round bead form that is particularly suited to buffering changes in the mid-range of 40-60% RH, and is, therefore, quite useful in most museum applications. Art-Sorb is also available in convenient premeasured, preweighed amounts enclosed in open-grid plastic tiles covered with a thin membrane of Gore-Tex® breathable teflon plastic. These tiles are easy to use, but somewhat expensive.

Flat sheets made of porous polyethylene-polypropylene plastic infused with silica gel powder from crushed Art-Sorb beads are also available. All silica gel works most efficiently if spread out for maximum surface exposure. Art-Sorb sheets capitalize on this principle for maximum rapid response. However, the conditioning power of the sheets is easily exhausted as they drift to recondition themselves with ambient relative humidity. The sheets are most useful in conjunction with other buffering materials in short-term applications, such as packaging objects for shipping.

Arten Gel® is another product that combines a gel capable of rapid response to sudden fluctuations in relative humidity with slower gels that act as a reservoir to buffer long term changes, while continuing to condition the fast reacting gel component. Because of its versatility, this gel is a good choice for long-term microclimate storage of unstable and extremely climate-sensitive materials.

Silica gel in all forms can be conditioned by spreading the gel on trays and placing it in a room known by the park's curatorial staff to have the desired RH%, or by placing the gel in an environmental control chamber for two weeks. However, the efficiency of all gels will decrease over time at a rate dependent on the exchange of air between the sealed container and the exterior room, and the innate characteristics of the chosen gel. To know when this happens, monitor the interior of the container with a humidity indicator strip. Use a clear plastic container such as a polystyrene or polycarbonate sweater box or nearly transparent freezer container with tightly fitting snap-on lids to house the material while allowing easy viewing of the enclosed humidity indicator strip.

Heat sealable clear plastic laminate films with excellent vapor barrier characteristics are now commercially available, and are very useful for making microclimate storage bags for large and awkwardly shaped objects. The plastic is a laminate of mylar and other stable plastics, and is easily heat sealed using a teflon

bar heat sealer or household iron. Bags can also be sealed with pressure sensitive polyethylene tape applied over a double fold.
NOTE: Avoid the use of pressure sensitive tapes in other applications. Because the plastic is clear, the humidity indicator card enclosed within can be easily seen without opening the bag.

When the enclosed humidity card indicates that the gel's buffering capacity has drifted, replace it with fresh gel, and recondition the old gel as described above. A reserve supply of premeasured silica gel packets should be prepared and stored in airtight containers for quick replacement of the exhausted gel. The gel can be completely dried by placing it in an oven (300-350°F) for two or more hours, depending on the amount of gel to be dried, or by microwaving at low power for at least 5 minutes. Spread the gel thinly in plastic dishes if microwaving, and in metal cake pans or cookie sheets if placing in a conventional oven. Dry the gel completely when using it to store archeological iron objects.
NOTE: Iron objects should be kept as dry as possible.

Premeasured packets of silica gel can be made by using fairly open weave lightweight washed muslin bags that are broad and flat like small pillow cases. Velcro® can be attached to one end so that the bag may be easily opened to regenerate the gel, filled again, and reclosed. Gore-Tex® and perforated Tyvek® can also be used for making bags. Clear resealable polyethylene freezer bags can be used as well by punching plenty of holes in the bags smaller than the grain size of the gel. A mixture of indicating gel (cobalt chloride impregnated gel that turns from blue to pink as humidity increases) and regular gel within clear plastic bags makes it easy to see when the gel needs regeneration without a humidity indicator card. This may be useful for objects like iron that need a dry environment, but perhaps less useful for objects requiring a set RH% level within the moderate range. Label all premeasured silica gel packets with the dry weight, date, and RH% of preconditioning.

The amount of silica gel used in a closed container depends on the volume of the container. The most common mistake in using silica gel is to use too little. It is better to use too much silica gel in a container than not enough. Twenty kilograms of silica gel per one cubic meter, or 5 lbs. of gel per cubic yard, is usually considered a sufficient amount. Once the initial calculations are made, use standard sizes of containers to streamline the production of premeasured silica gel packets.

Within the container, the object should never be in direct contact with the silica gel. Make sure that there is always a barrier between the object and the gel, but remember that the gel is most effective with maximum surface exposure, and organize the contents of the container accordingly.

b. Standard Boxes

There are many different types of standard boxes that are appropriate for storing archeological material. For example, boxes manufactured for the storage of archival and photographic collections are well suited to the storage of small objects like lithic points and nails. Small resealable polyethylene bags can be used for each individual specimen, and stacked vertically within each section of the box. Include an acid-free tag with the identification number inside the bag as well as writing the number in a standard location on the outside of the bag. Small objects may also be enclosed in a small self-sealing bag and stapled to a 3"x5" or 5"x8" notecard containing the provenience data and catalog information. The notecards can then be stored in a standard archival quality file box. Refer to Figure I.2.

35mm slide box with movable dividers

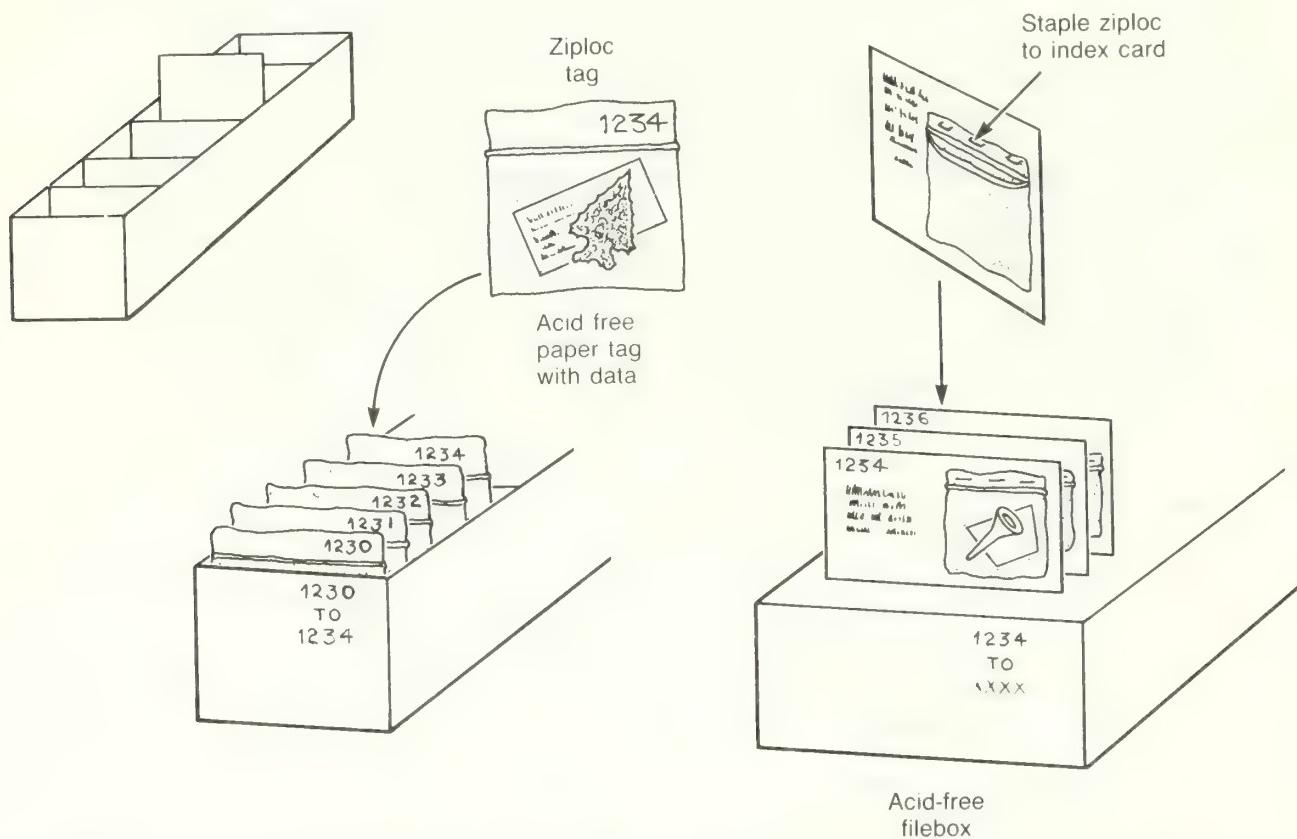


Figure I.2. Vertical Stacking of Small Objects Within Standard Containers

Acid-free boxes with lids are preferable to self closing boxes because the contents are more easily available without destroying the integrity of the box by cutting or peeling back tape, or repeatedly folding back flaps.

Be as consistent as possible in packaging objects within a box so that staff and researchers can predict the orientation of objects within closed containers to minimize accidental mishandling during retrieval. Include written descriptions and/or drawings of packing techniques with the supporting documentation of the collection to narrow the possibility of damage to the object during unpacking. Consider placing description of the packing technique on inside of the box lid. Easy visual access is important. Objects should never be wrapped or wound in padding material making excessive handling necessary to retrieve the object.

1) Padding

Padding material within the box should prevent contents from shifting if the box is moved or handled carelessly. Avoid overstuffing the box with crumpled tissue or other padding material that could exert damaging pressure against the objects enclosed, or hinder easy access to the contents. Crumpled paper wads expand to fill the space in which they are placed, and press against the surface of the object. This situation can cause damage when the object is removed from the box, or when stuffing is removed from the interior of an object, particularly if the object has a fragile surface or brittle projections that are easily snagged and broken.

Instead of crumpling wads of tissue paper, make smooth pillows by wadding acid-free unbuffered tissue paper and folding the wads in a loose roll of tissue to make a smooth surfaced pad to place against the surface of the object. Wrapping crumpled wads in tissue also restricts the expansion of the crumpled paper, and may alleviate expansion pressure against fragile surfaces.

Sandwich size resealable polyethylene bags filled with cotton balls also make good padding and support material for fragile objects. Cotton or polyester wool alone should not be used in direct contact with any object. Cotton is an excellent sorbent, and may hold moisture directly against the object, encouraging moisture related problems such as corrosion and mold. Cotton fibers also easily snag and entwine artifact elements, making separation of the object from the cotton difficult without damaging the object.

2) Organization of Box Contents

Regardless of size or type of box, it is important to organize the contents to make retrieval of specific items easy without rooting through the contents of the box and possibly damaging fragile material.

One strategy is to organize the box into distinct layers. If the contents are lightweight, such as cordage fragments or botanical specimens, they can be organized into three or four

layers depending on the size of the specimens. Heavier objects should always be on the bottom layer. Museum specimen trays, listed in the NPS Tools of the Trade, can be used in each layer to make the lifting of contents easier. Interleave the layers with a sheet of polyethylene foam shelf liner, also listed in Tools of the Trade. The foam will serve as a clear demarcation between layers as well as providing cushioning. Refer to Figure I.3. Acid-free boxes with fitted trays equipped with adjustable interior compartments are now manufactured by museum supply companies, and are ideal for the storage of archeological material.

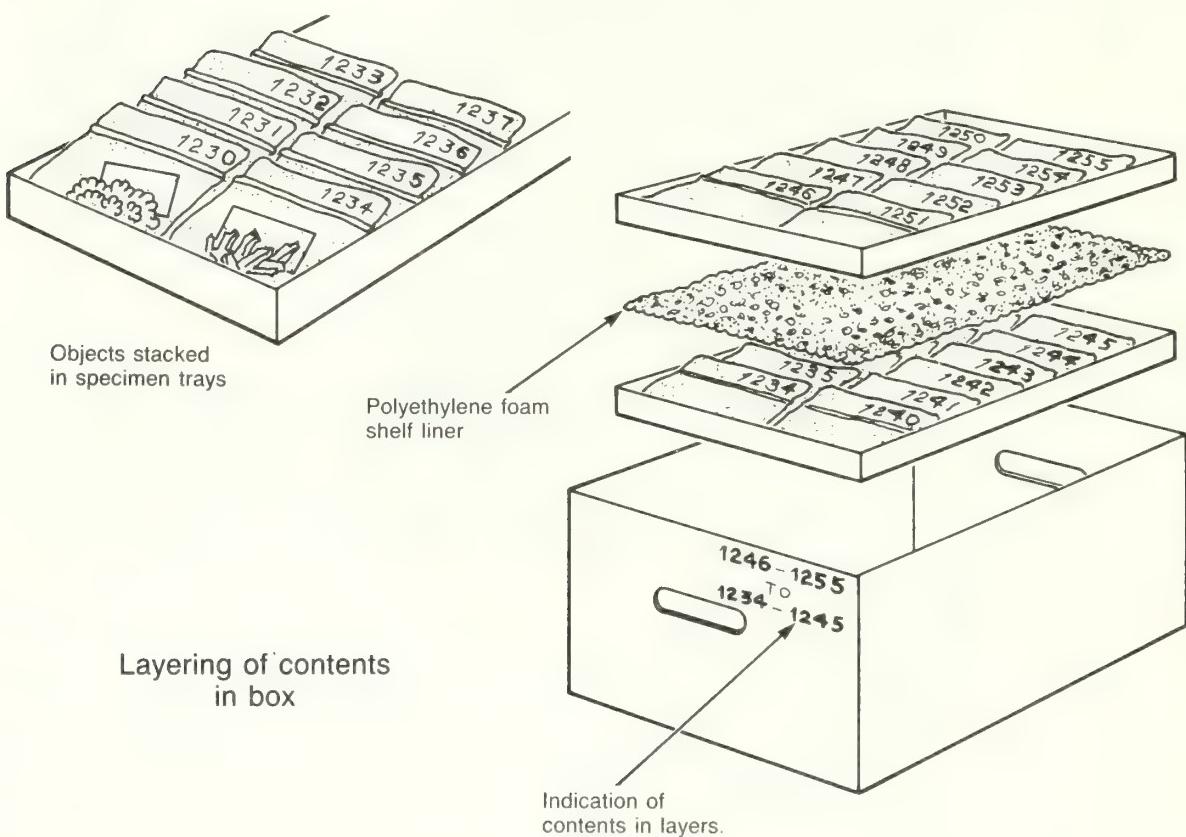


Figure I.3. Organization and Layering of Objects within a Storage Box

3) Inventory of Contents

Small objects should be individually bagged in small resealable polyethylene bags. Include an acid-free paper tag with field data or catalog number written in pencil or water-proof India ink within each bag. Stack the bags in each layer like fanned out playing cards, with identification numbers written on the top of each bag for easy reference. Identification numbers should be written on all bags as well, and should be visible

when the bags are stacked and fanned out to avoid needless handling when locating a specific item.

Identification numbers of the contents should be written on the outside of the box by layers, and a more detailed list of the contents of each box should be prepared and placed on top of the contents in the box.

c. Support Trays for Objects

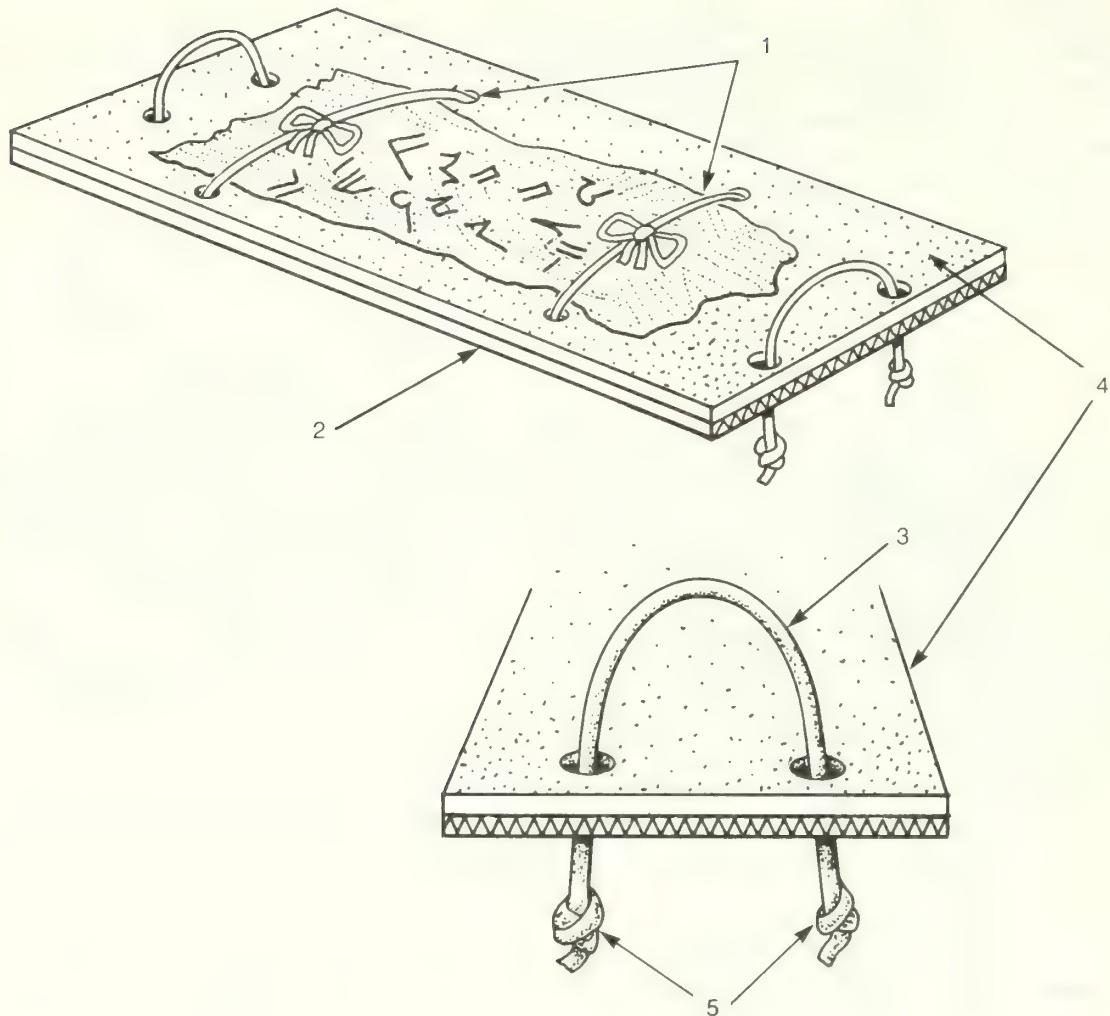
Remember that all archeological objects should be handled and moved by means of a supporting tray or container. The support can be as simple as the standard museum specimen trays supplied by the Curatorial Services Division's Museum Equipment and Supply Program. If the object is too large to fit a standard tray, a support tray can easily be made from a padded acid-free corrugated cardboard or other rigid board fitted with handles of cotton twill-tape threaded through punched holes as illustrated in Figure I.4. Depending on the weight of the object, there are many boards including cardboard, foamboard, and honeycomb board, that can be used for making support trays. Make sure to select a board that will remain rigid while bearing the weight of the object to avoid sagging and a trampoline effect that could damage rather than successfully support the object. For added security, tie the object to the tray with cotton twill tape. Tie the tape in a bow so that it is easily untied.

Support trays also can be fitted with customized supports for objects with fragile surfaces such as delaminating glass. Figure I.5 illustrates the use of Ethafoam® blocks to support a fragile bottle.

Ethafoam®, a stable closed-cell polyethylene foam, is useful for making both tray supports and trays with cavities for fragile three-dimensional objects. Electric carving knives are useful for cutting large blocks of Ethafoam®. Cavity packing is a good technique to use when the object must be moved periodically for research or other purposes, or when the object has no even footing and needs support to keep it stationary. Make sure that the fit of the object in the cavity is not too tight, and that the object may be safely removed from the tray. If necessary, carve finger grips on either side of the object to assist in lifting the object from the tray. See Figure I.6.

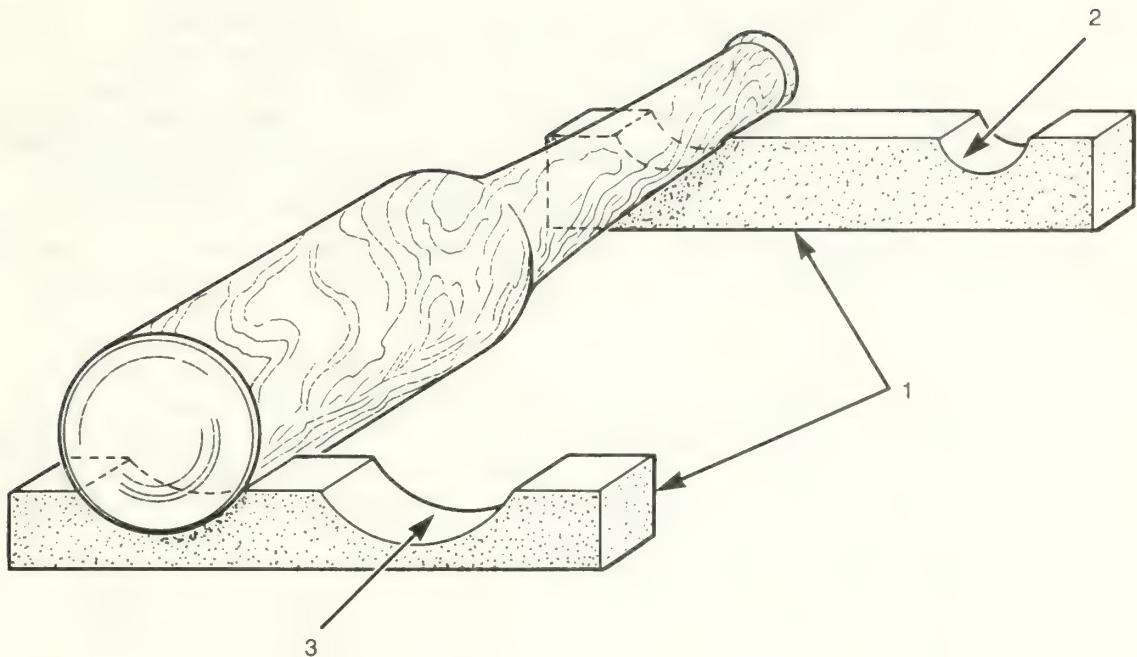
d. Storage Mounts

Archeological objects are often weak due to deterioration during the underground period. They may require specialized supports to maintain their structural integrity. Before designing a specialized mount, evaluate the points of structural strength and weakness of the object. In order to assess the object, it is important to determine what the object is, how the object was used



1. Twill tape tied loosely in bows over object to secure it to the tie tray. The method of attachment should be both obvious and easily unfastened.
2. *Rigid board*: acid-free cardboard; fluted plastic, Fome-cor, Tycore.
3. Twill tape or nylon rope.
4. Line rigid board with a polyethylene foam pad. Cover foam with washed muslin or unbuffered acid-free tissue. Attach the lining to the board with a good quality double-sided tape (e.g., Scotch 415) or with a hot gun. If the support tray is small, the twill tape ties should be enough to hold both the pad and the object in place.
5. Knots *larger than punched hole*.

Figure I.4. An Easily Made Support Tray for Fragile Material



1. Use Ethafoam blocks to support complete ceramic or glass bottles. Ethafoam blocks can be placed in specimen trays on shelving or in museum specimen cabinet drawers.
2. Cut out wells in each Ethafoam block to fit the diameter of the neck and bottom of the bottle.
3. Because cut Ethafoam can be scratchy, line each well with strips of Tyvek or smooth foam sheets to protect the surface of the bottle from possible abrasion. Remember that the surface of iridescent excavated glass is particularly fragile. The bottle should never be made to fit tightly into the Ethafoam support.

Figure I.5. Customized Support Blocks For a Fragile Glass Bottle to be Fitted in a Museum Specimen Tray

or worn, and how the object was made. For example, conical-shaped baskets, which were often worn like backpacks, were used to carry objects, and consequently, load stresses were distributed down the sides of the basket and concentrated in the bottom. The rim is the weakest part of these baskets, and yet, they are most often stored upside down like traffic cones.

A successful storage mount takes into account the form and function of the object while minimizing any load or gravity stress that the weakened object is no longer able to bear. For objects with an unstable base, a cradle mount can be easily made to evenly distribute the weight of the object and keep the correct orientation of its use as originally engineered. See Figure I.7.

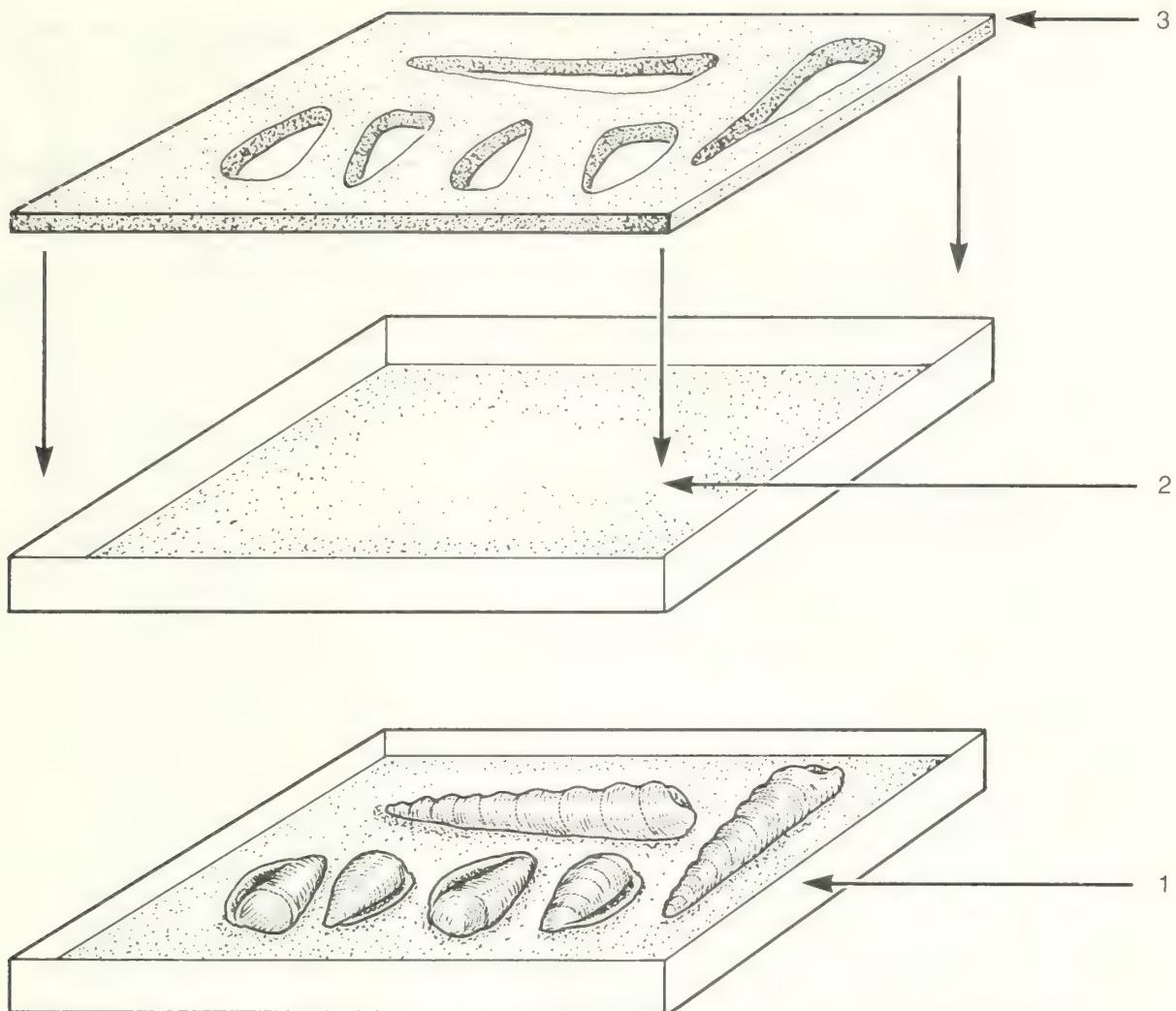
e. Special Containers

Consider the goals of the researcher before designing a special storage container for an object. For example, a container intended to house an archeological textiles fragment should protect the object from both dust and light, and perhaps provide some moisture buffering ability as well. However, a researcher may want to examine both sides of the textile without visual interference. The container must permit close examination of the contents while minimizing the need to actually handle the object. Portfolio mounts as illustrated in Figure I.8 are a good solution to this problem.

The technique illustrated in Figure I.8 also can be adapted to the storage of other "flat" objects like basketry fragments, thick cordage and other fragile materials. Simply adjust the thickness of the interior mat to accommodate the dimensions of the object and avoid any unsafe pressure or crushing of brittle elements.

When making a special box for an object, the same principle of maximum visual access and minimum handling applies. Support of the object is of primary importance, and the object needs to be supported on a tray by which it can be removed from within the storage box. Design or choose a box with a drop-front construction that allows the object to be slid out onto a stable surface rather than hoisted up and out like a turkey from a roasting pan. Think of the logistics of handling both the object and the container. Anticipate accidents when designing special containers and incorporate features and measures to protect the object from mishandling.

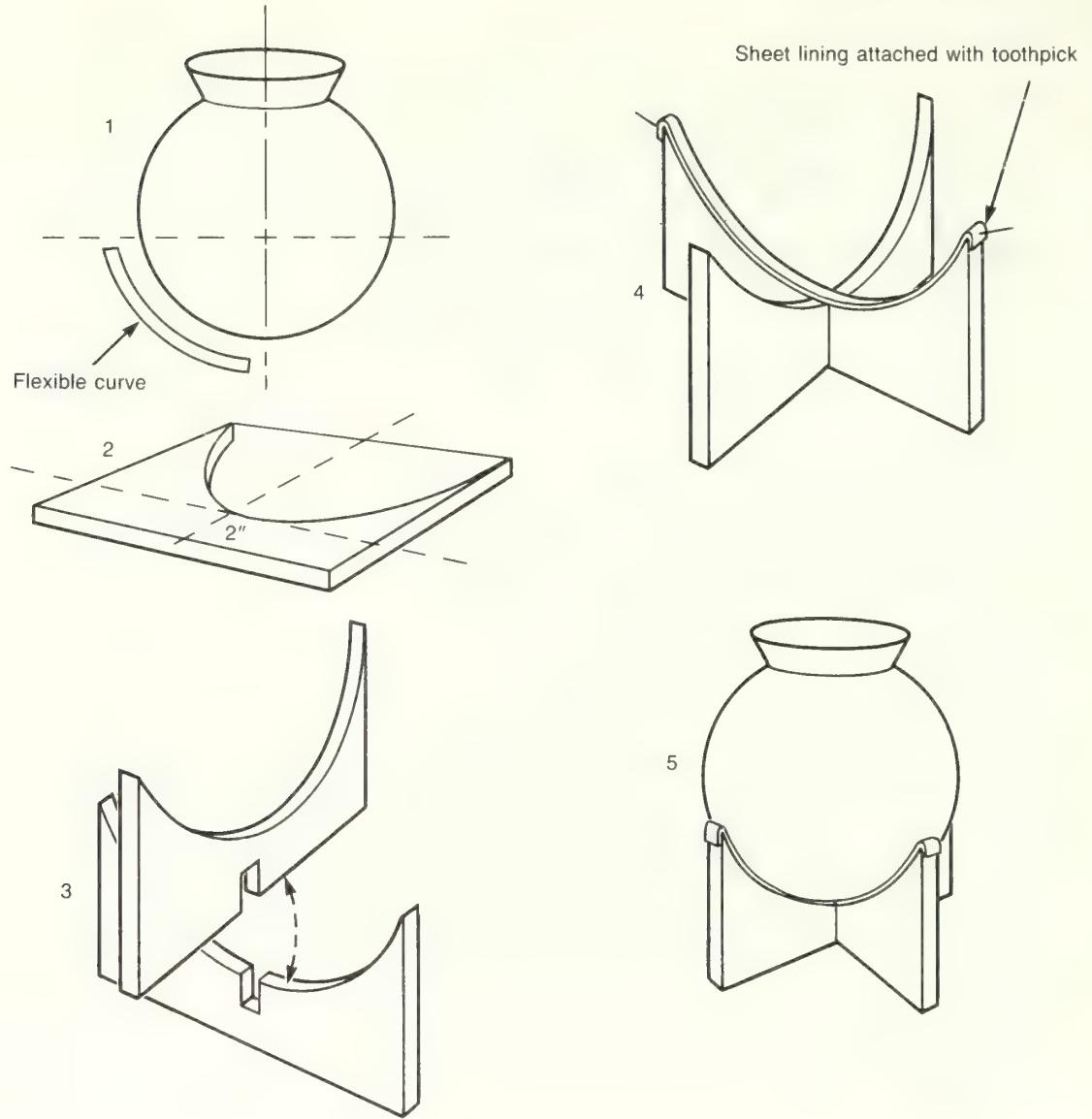
Special containers and mounts also may be necessary to protect fragile, unstable, and top-heavy objects from damage during an earthquake. It also is important to prevent objects and mounts from moving or shifting on shelves and within cabinets to maximize earthquake protection.



1. Isolating objects in separate cavities restricts movement and provides easy accessibility. A number of small objects may be accommodated in a museum specimen tray.
2. Line the bottom of a museum specimen tray with 1/4" thick polyethylene foam.
3. Mark the outline of the object on a second sheet of 1/4" polyethylene foam. Be very careful not to touch the object with the marking instrument. Avoid using a pen. With a freshly sharpened pencil, puncture the foam around the object and twist the pencil to obtain a clear mark in points about 1/4" apart for small objects and 1" apart or more for larger objects.

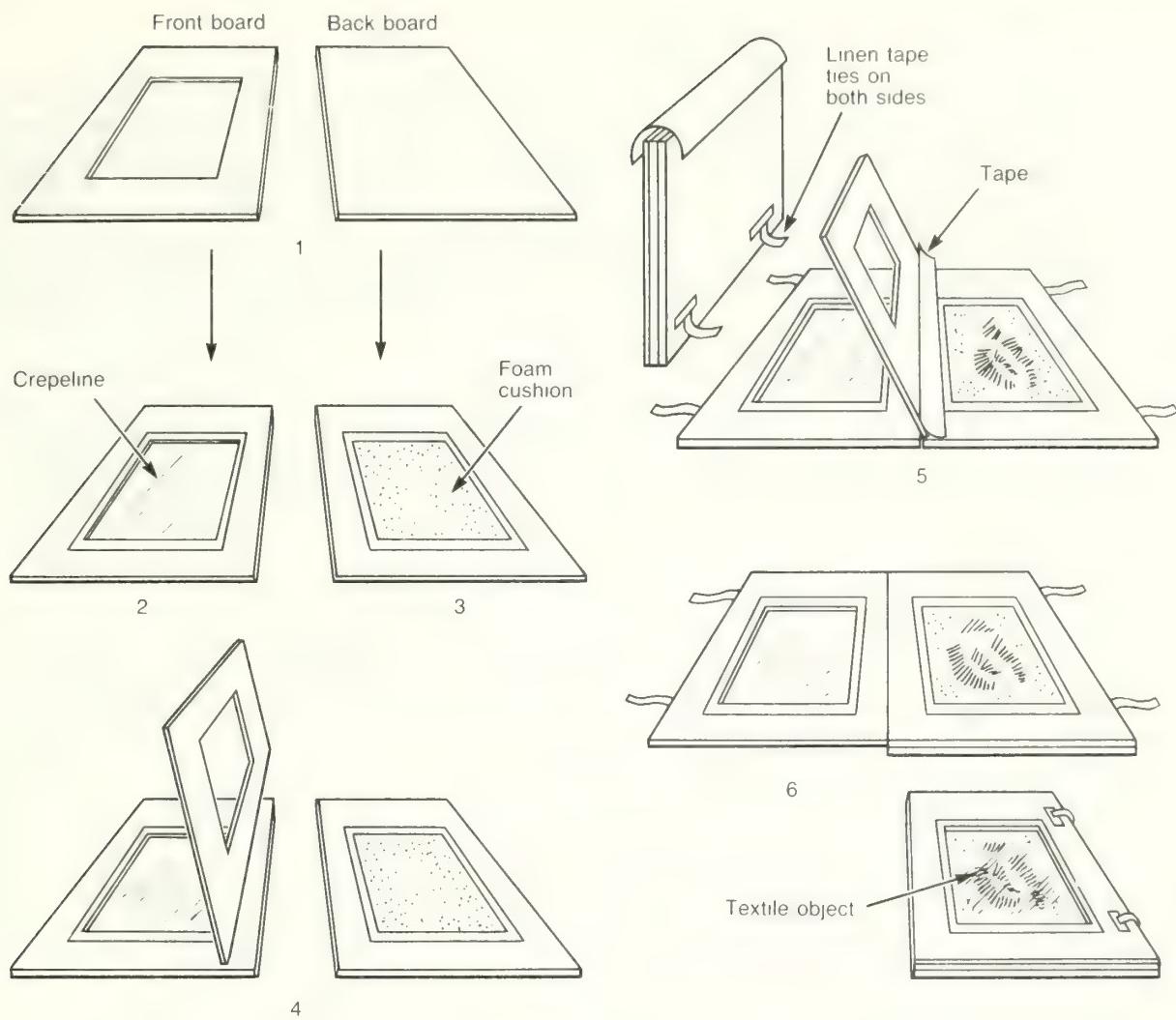
Move the object out of the way, and cut out this shape by "connecting the dots" with an X-acto knife.

Figure I.6. Cavity Packing Technique for Small Objects



1. Starting from the center of the vessel, measure the curve from its base up to 1/3 of its height with a flexible drafting curve.
2. Use 1" – 2" thick ethafoam (thickness depends on the size of the vessel to be supported). Leaving 2" at bottom of ethafoam sheet, mark the profiles of a full cross-section of the object. If the shape of the object is not too eccentric, flip measured curve on one side to the other side as illustrated. Cut cross-section profile out with a sharp knife. Repeat technique to produce another cross-section to be used to bisect the first one.
3. Cut a 1" by 1" notch in the center of the base of one cross-section as shown in 3A. Cut a 1" by 1" notch in the center of the top of the curve in the other cross-section as shown in 3B.
4. Fit both cross sections together at the notches. Cut thin foam sheet for lining the cradle surfaces. Pin foam buffering strips to cradle surfaces with toothpicks as shown.
5. Place vessel in the cradle.

Figure I.7. Construction of a Cradle Mount for Objects With Round Bases



1. Cut out front and back of portfolio from a sheet of museum quality mat board. Cut window out of one board. Make window 1/2" to 1" larger than the dimensions of the textile fragment.
2. Cover window with silk crepeline or polyester stabiltex. Pull taut over window opening and attach with water activated acid free linen tape.
3. Cut a piece of cushioning material (e.g. sentinel foam volora, microfoam) to the inside dimensions of the window. Place material on board. Cover the foam with a non-woven polyester fabric such as Reemay 2014 and attach with water activated linen tape.
4. Prepare a third board identical to the window front board. Use this board as a spacer to protect textile specimen from being crushed.
5. Stack the three boards. Atiach water activated linen tape along the outside edge like a book-binding. Attach linen bias tape ties with water activated tape to the front and back boards. Open portfolio and attach center spacer with water activated tape
6. Place textile fragment on cushion and close the portfolio. The silk crapeline window facilitates visual identification of specimen without having to open the mount and protects the textile specimen from dust.

Figure I.8. Construction of a Portfolio Mount for Archeological Textile Fragments

F. RECOMMENDED STORAGE MATERIALS

All materials used in the packaging of archeological material should be as chemically inert and stable as possible. This is particularly important for the storage of climate-insensitive materials frequently relegated to "benign neglect" in general storage. The initial packing might well be the only attention that it will receive for years, apart from basic housekeeping procedures in the storage space(s). For this reason, the packing materials should be of high quality, not so much for the benefit of the climate-insensitive materials, as for the longevity of the storage packaging itself.

The following list includes many (not all) materials that are suitable for long-term storage of archeological collections. Refer to the NPS Tools of the Trade and consult with the Regional Curator, conservators and the Curatorial Services Division, WASO, for sources of these materials and additional information.

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Boxes:		
Acid-free document storage boxes (e.g., Hollinger® and other specialty archival boxes)	Liquor, grocery and cigar boxes	Unstable materials; potential insect infestation from previous contents and previous storage conditions
Good quality <u>new</u> cardboard boxes. Use for storage of bulk climate-insensitive material. (Available from GSA)	Used boxes with labels crossed out	Difficult to read what the current contents are through clutter of previous inventories
Clear polystyrene boxes (variable sizes)		
Polypropylene plastic containers		
Polyethylene plastic containers with snap-on lids		

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Bags:		
Resealable polyethylene bags (e.g., Ziploc® also available from GSA, Baggies®, Whirl-pak®)	Kraft lunch bags, waxed paper, envelopes	Unstable materials; waxed paper can transfer wax to object; no visual accessibility
Tyvek® (spun polyethylene bags, available from forestry supply companies)		
Padding:		
Non-buffered acid-free tissue (neutral pH)	Buffered acid-free tissue Kleenex®, paper towels, toilet paper Newsprint, newspaper	Possibility of influencing research chemical analysis by placing object in an alkaline environment Contain impurities; not durable Very acidic; ink readily smears and can transfer to surfaces
Cotton or polyester batting in plastic or muslin bags	Loose cotton Excelsior Vermiculite Bubble-pak, air-cap	Easily snags brittle materials; can transfer lint to object Acidic Generates dust difficult to remove from object; health hazard to museum worker May contain polyvinylidene chloride (see plastics section)

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Plastic Foams		
Ethafoam 220® (manufactured by DOW); polyethylene closed-cell foam (<u>white only</u>)	Blue Ethafoam (fire retardant) Pink Ethafoam (anti-static)	Fire retardant additives can migrate to materials. Introduced conductor in foam absorbs water from air and can become soapy
Microfoam® (manufactured by Amatek); low density, closed cell polypropylene	Any chlorinated or nitrated plastic (e.g., PVC-Polyvinyl chloride)	Outgases hydrogen chloride; can produce hydrochloric acid
Sentinel® Foam (manufactured by Packaging Products); polyethylene		
Extruded polystyrene (e.g., Foamular®, manufactured by Fomeboards Co.)	Polyurethane plastics, sheet and foam	Unstable; danger of off-gassing harmful products
Plastozote® (manufactured by Bakelite Xylonite, Ltd.); polyethylene closed-cell foam	Ethylene vinyl/acetate (EVA)	More elastic and rubbery than polyethylene; can cause yellow staining
Volara®, (manufactured by Voltek Co.); Cross-linked polyethylene foam		
Plastic Sheets:		
Mylar® (manufactured by DuPont); polyethylene terephthalate clear polyester	Saran-Wrap®, (e.g., polyvinylidene chloride)	Unstable, chlorinated plastic

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Plastic Sheets (cont.)		
Film-O-Wrap 7750® (manufactured by Bell Fiber Products Corporation); clear polyester and fluorocarbon laminate Scotchpak® (manufactured by 3M Company); clear polyester/polyolefin laminate)	Cellophane	Acidic by-products due to sulphuric acid used in manufacturing process.
Boards:		
Archival corrugated board Acid-free Fome-Cor® (manufactured by Monsanto); extruded polystyrene core covered with acid-free paper Art-Cor® (manufactured by Monsanto); extruded polystyrene with polystyrene skin Honeycomb boards e.g., Tycore®, manufactured by Archivart) acid-free rigid paperboard; Hexcels Honeycomb®, manufactured by Hexcels Co.; aluminum-board.	Regular cardboard	Acidic

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Boards (cont.)		
Fluted polypropylene boards (e.g., Cor-X®, manufactured by Fomeboards Co.; Coro-plast®, manufactured by Coroplast Inc.) Double-walled polycarbonate (e.g., Lexan Thermoclear®, manufactured by Cadillac Plastics)		
Microclimate:		
Silica gel grade 03, mesh size 3-8 (Source: laboratory and chemical supply companies) Silica gel RD03® (manufactured by W.R. Grace & Co., Davison Chemical Division) Art Sorbo®, gel beads and unpregnated sheets (manufactured by Fuji-Davison Co.) Gore-Tex® silica tiles (manufactured by W. L. Gore & Associates) Humidity indicator cards (order from the Curatorial Services Division)		

RECOMMENDED STORAGE MATERIALS

USE	DO NOT USE	WHY NOT
Tape:		
Water-activated paper and linen tape	Pressure sensitive tapes; masking, strapping, duct and electrician's tape	The adhesive degrades and the carrier peels off leaving residues and stains
Cotton or polyester twill tape	Rubber bands	Rubber degrades and sticks to surface
Fabrics:		
Silk Crepeline (Talas; Conservation Materials, Ltd.)		
Polyester Stabiltex (Talas)		
Reemay 2014 (Talas); non-woven polyester fabric		

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APPENDIX J. CURATORIAL CARE OF PAPER OBJECTS

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APPENDIX J. CURATORIAL CARE OF PAPER OBJECTS

A. INTRODUCTION

Handmade from naturally occurring plant fibers in a labor intensive process, paper was for centuries a precious commodity, expensive and scarce. Paper is popularly believed to have been invented in China, some 2,000 years ago. In ancient times, it was exported throughout the known world, although the papermaking process was a closely guarded secret. In the late Middle Ages, papermaking technology was imported into Europe.

The first American papermill was established in the late seventeenth century. By the early nineteenth century, there were almost two hundred mills making handmade paper in the United States. Despite many innovations, paper continued to be made by hand from rag fibers. While the quality of the finished paper varied enormously, even the lowest quality rag paper was expensive.

Advances in papermaking technology during the nineteenth century Industrial Revolution made possible the production of abundant and inexpensive paper for the first time in history. In the United States, handmaking processes were replaced by mass production of machine-made paper. The increased demand for fibers was met by making pulp from wood. The cheapest paper, made entirely of groundwood pulp, was used mainly for printing newspapers and broadsides, and in other commercial applications. While some of this paper survives in archives, it is usually in very poor condition, because of its inherent chemical instability.

Higher quality machine-made paper included at least some rag fiber, and was used in finer applications (e.g., stationery, books, and artistic works). Some applications, such as photography required a high grade paper made entirely of rag fibers, and such paper continued to be available. American machine-made imitations of handmade paper were marketed, and true handmade paper continued to be imported from Europe. True handmade paper was not produced commercially in the United States until the technology was revived by papermaking artists in the mid-twentieth century.

Along with these advances in the technology of papermaking came advances in printing, photography, and reprography. Historic collections may contain a variety of papers, used in many ways to produce records and other paper objects. Objects predating the mid-nineteenth century are fairly uniform in character. Paper objects produced after this period vary widely in structure and composition, and, thus, in permanence. The book Papermaking by Dard Hunter, listed in Section E of this Appendix, provides an excellent history of the technology of papermaking. Marjorie Cohn discusses how papers are made and used, and how this affects the object's appearance in Wash and Gouache, "Paper and Paper Preparation", pp. 16-26. This book also is listed in Section E.

This appendix discusses the curatorial care of a range of paper objects, from small to oversize, including archival and manuscript materials (e.g., documents, letters), prints and drawings, maps and architectural records.

This appendix does not address the care of photographs and books. Paper materials are fragile and most susceptible to deterioration caused by agents of deterioration and by inherent defects. Preventive care is critical to preserving paper collections. Even papers considered durable are easily damaged by poor environment, improper storage and exhibit techniques, and careless handling. Once the object is stained, embrittled, torn, or creased, it becomes all the more fragile. Conservation treatment (e.g., repair) is expensive in staff time, workspace and the cost of materials, and is often not justifiable for historic objects which may have little monetary value. Even when a paper object can be treated by a conservator, its historic structure and appearance are usually altered in the treatment process.

B. THE NATURE OF PAPER

1. Structure of Paper

The primary component of paper is cellulose. The structure of most kinds of paper is similar, regardless of the fiber source. A sheet of paper is actually a web of fibers, held together by their physical entanglement, by very weak chemical bonds between the fibers, and by the weak adhesive power of the "sizing", a substance often added to the paper as it is made. In addition to sizing, the paper may be permeated with a "filler", such as clay. Sizings and fillers are used to control the properties of the paper. For example, they make paper less absorbent and smoother to facilitate printing, as with heavy, shiny art book paper and glossy magazine paper.

The paper itself is usually only part of the object. It is often referred to as the "support." Equally important are the media used on the paper. A collection of correspondence, for example, may include media as diverse as old handmixed inks, modern ballpoint pen inks, graphite, colored pencils, and wax crayons. These are examples of hand-applied media.

Media applied by hand can be distinguished from media applied mechanically or reprographically. Mechanical processes of reproduction include letterpress, steel engraving, and lithography, all of which use the medium of printer's ink. More modern reprographic processes such as mimeography and xerography use a wide variety of inks, pigments and binders.

A variety of fibers have been used historically to make paper. In the western hemisphere, plant fibers such as cotton and flax were used to make paper by hand as early as the 14th century A.D. This labor-intensive process produced a strong and durable paper that was also very expensive. As the need for paper exceeded the supply of virgin fibers, recycled plant fibers obtained from cotton and linen rags were also used to make paper. The term "rag" paper means any paper made solely of cotton or linen fibers, whether the source was the plant or cloth made from the plant. Paper objects dating from before the mid-nineteenth century almost always are made of handmade rag paper.

Beginning in the mid-nineteenth century, the quality of paper declined. The technology was developed to extract the fiber from wood, making paper inexpensive and abundant. The cheapest type of fiber for papermaking pulps is obtained by simply grinding up lumber. Paper (e.g., newsprint) made by this process is known as "groundwood" paper. Along with the cellulose fibers, groundwood paper contains the other materials which occur naturally in wood (e.g., lignin). Lignin, a plant protein, is inherently unstable and generates acid as it deteriorates. Cellulose has a chain-like structure that is very vulnerable to attack by acid. Acid generated by the deteriorating lignin cuts the cellulose chains, making the fibers shorter and

weakening the paper. Groundwood paper begins to deteriorate as soon as it is made. Other plants (e.g., hemp and manila) are also used for paper fibers. Papers made with these fibers have similar problems caused by naturally occurring acidic properties.

Another type of paper is made from groundwood pulp that is chemically purified to remove all but the cellulose fibers. This "chemical woodpulp" paper is not as strong as rag paper because its fibers are much shorter. However, it is not self-destructive like the groundwood paper because the acid-generating properties have been removed.

The quality of paper is determined by its durability and permanence. The degree to which paper retains its original strength during its history of use is called durability. The degree to which paper remains chemically stable and resists deterioration from inherent impurities or environmental agents of deterioration is called permanence.

2. Problems with Paper

Every paper object is a combination of fibers, adhesives, and media. If any of these elements are unstable, the paper object will be inherently unstable and will deteriorate, as illustrated by the following examples:

a. A manuscript (iron gall ink on rag paper sized with gelatin)

The gelatin size originally served to make the paper repel the watery ink, preventing the ink from feathering and bleeding into the paper as it was applied. The gelatin size has degraded and any water applied now will be quickly absorbed by the paper.

The rag paper itself is still strong and durable, except where the iron gall ink has been applied. The ink contains sulphuric acid that has damaged the paper. Overtime, the ink has eaten into the paper, most severely where it was thickly applied. The iron gall ink has almost certainly faded from its original black to its present brown color.

b. A pencil drawing on tracing paper

The paper was made transparent by impregnating it with resin. Over the years, the resin has oxidized, darkened, and made the paper very brittle. The image, made with graphite pencil, is chemically stable, but may be mechanically damaged or lost by abrading, rubbing, or smudging.

c. A newspaper (printer's ink on groundwood paper)

Groundwood paper becomes acidic as it ages. This acid has broken down the fibers so completely that the paper now shatters when

flexed. The printer's ink is stable, and does not appear to have faded. The oil in the ink may be slightly acidic.

Even when all the paper object's elements are stable, if they do not respond uniformly to environmental changes the object will be inherently unstable in some environments. The following examples illustrate deterioration caused by internal qualities, a condition called "inherent vice."

d. An electrofax copy

The paper is chemical woodpulp, free of organic acids. The paper's coating is made of zinc oxide and starch, both inert. The image is made of carbon black, a lightfast pigment, heat-fused onto the paper surface. Taken separately, each element is stable; however, since the elements do not behave uniformly, the object is inherently unstable. When damp, the object is extremely unstable. The incompatibility results from different physical responses to water. The paper expands, but the zinc oxide coating does not, causing the coating to separate from the paper. This effect is most obvious when water is sprayed onto the object, but may be subtle when it results from exposure to water in the form of high relative humidity.

e. An ink drawing on paper with a paper patch

The ink is a lightfast and waterproof India ink. The paper used for both the drawing and the patch is a rag paper, sized with gelatin. The incompatibility of the drawing and patch results from the way the patch was applied. Paper expands and contracts as the relative humidity rises and falls, usually more so in one direction than in the other. The grain of the large piece of paper is parallel to its long dimension, and the paper tends to expand and contract least in this dimension. The grain of the patch and the grain of the larger piece of paper are not aligned, so the patch tends to expand and contract in a different direction. Over the years, small differences add up, so that now, large cockles radiate from the patch. These cockles prevent the drawing from lying flat. If the drawing is forced flat by weighting it, folds and creases will form at the cockles. Paper tends to be abraded from the highest surfaces of folds and creases, further damaging the object.

The deterioration of paper may result from internal causes (e.g., poor quality pulp, bleaching residues, unstable sizings, and acidic inks). In addition to these built-in weaknesses, external agents (e.g., fluctuating temperatures, high and fluctuating relative humidity, light, air pollution, pests, contact with acidic materials, careless handling, and natural disasters) may cause paper objects to deteriorate. Inherent weaknesses and external agents often reinforce each other to cause a vicious cycle of deterioration. It is useful

to think of deterioration as either chronic or acute. The distinction between chronic and acute deterioration is one of time rather than of cause.

Chronic deterioration occurs over a long period of time. It is caused by "inherent vice" (e.g., acidic properties in the structure or media) and by long-term exposure to high relative humidity, high light levels, poor quality enclosure materials and improper storage equipment. Chronic deterioration sometimes goes unnoticed because it occurs gradually.

Acute deterioration is more immediate in its effects. Disasters (e.g., flood and fire) and biodeterioration (e.g., insect infestations or rampant mold growth) cause acute deterioration. Mechanical damage to paper objects from folding, tearing, and abrasion can cause acute deterioration, although the gradual wear-and-tear on collections caused by poor handling practices is considered chronic.

Acute deterioration such as the accidental tearing of a paper object might seem to have been caused by an isolated set of circumstances. Answer the following questions:

- What chronic conditions may have contributed to this event?
- Are objects being damaged because of these conditions, perhaps with results which are less noticeable than this tear?

Note: The conditions causing chronic deterioration may be due to a combination of factors: (1) inadequate housing so that the object is not physically protected from damage during handling, and (2) poor storage conditions (e.g., high temperature and low relative humidity) so that the object has become embrittled, and therefore, more susceptible to damage.

C. AGENTS OF DETERIORATION

1. Environment

As discussed in Chapter 4, there are four main agents within the environment that cause deterioration: relative humidity, temperature, light, and air pollution. At unacceptable levels, each of these agents alone can cause or hasten the deterioration of paper objects. Their combined effects are even more damaging. Paper objects are also vulnerable to biological deterioration through the actions of molds, insects, and rodents. Refer to Chapter 5 for a discussion of biological infestations.

a. Temperature

Most of the chemical reactions by which paper objects deteriorate proceed twice as fast with each 5.6°C (10°F) increase in temperature. For this reason, paper, especially "groundwood" papers, should not be exposed to high temperatures. High temperatures cause brittleness.

Different materials can respond differently to changes in temperature. Some of the materials found in paper objects, such as gelatin adhesives, are very reactive to changes in temperature, shrinking and relaxing as temperature rises and falls, while other materials are less reactive. Changes in temperature can thus cause damage within the object.

Paper objects should be stored at a constant temperature, theoretically the colder the better. However, when the objects are accessed, they will need to be brought to room temperature. A change from 12.8°C (55°F) to 18.3°C (65°F), if it were to occur too rapidly, would cause condensation on the objects. Practical considerations suggest a temperature of $15.6\text{--}21.1^{\circ}\text{C}$ ($60^{\circ}\text{--}70^{\circ}\text{F}$).

b. Relative Humidity

Cellulose is hygroscopic. It has a physical attraction for water, making relative humidity (RH) one of the critical factors in the paper object's environment. Paper contains water both within its chemical structure and bound loosely to its surface. The water in paper is in equilibrium with the water in the air. As the relative humidity drops, paper gives up water to maintain this equilibrium. It contracts physically, becoming smaller as it loses water. Paper will give up the loosely bound surface water first. It will regain this water if the relative humidity rises, expanding again as it takes in the water. Once the surface water is gone, the paper is forced to give up structural water. This water cannot be replaced, leaving the paper permanently dessicated. Dessication can cause embrittlement. Some media, such as inks and gum-based watercolors, are similarly responsive to changes in RH and can become dessicated.

Papers are more or less responsive to moisture depending on their composition. Thin papers such as tracing papers and onion skin typing papers are especially responsive to changes in relative humidity, expanding dramatically in humid air and contracting in dry air. Thick, heavily sized papers such as ledger papers and paperboards are more impervious but still respond on a smaller scale to changes in RH.

In a temperate climate the optimum relative humidity would be about 47%. However, other opposing requirements, such as the needs of other objects of differing materials, the ambient RH for the geographic region, and facility limitations, may lead to a compromise at another level within the range 45-55%.

Paper requires a certain amount of water to be flexible. At an RH level below 40%, paper becomes less flexible and more susceptible to damage from handling. Below 40% RH rolled papers are more easily torn during unrolling, pamphlets and stapled sets of sheets are more easily broken when the paper is flexed; thick paperboards tend to break when flexed.

High relative humidity levels (i.e., above 68% RH) can contribute to paper deterioration in several ways. High RH encourages infestations of insects, that physically consume parts of paper objects and leave damaging waste products on the surface. The most familiar problem resulting from high RH is mold growth. Mold feeds on the sizings, coatings and adhesives found in paper objects. It can leave the paper structurally weakened, chemically altered, and stained. Severe mold growth can leave records illegible and so structurally damaged that the sheets of paper either fall to pieces when handled or are stuck together in a massive block.

A more subtle kind of damage from relative humidity can occur within paper objects. Rapid fluctuations outside of the acceptable $\pm 3\%$ RH are deleterious because they cause the paper objects to continuously expand and contract. The greater the range of fluctuation, the greater the stress caused to the object. Such continuous stress is especially damaging to objects that are composed of more than one material.

Materials respond to RH depending on their attraction to water. As noted before, paper expands when the RH level rises and contracts when the RH level falls. If a paper object is held tight by a binding, adhesive or fastener, for example, it may be damaged where it is constrained from expanding and contracting. If the object is a combination of paper and another material, it will be inherently unstable if the other material responds differently to changes in RH. An example is a paper object mounted on cardboard. Over the years, the paper has responded to changes in RH by expanding and contracting much more than the

cardboard mount. The surface of the paper now has a cockled or buckled texture resulting from its expansion being hindered where it is attached to its mount.

c. Light

The effect of light on paper objects is cumulative and irreversible. Both visible light and ultraviolet radiation cause serious damage to paper objects. Some papers and media are more sensitive to damage by light than others. However, no papers of historic value should be displayed long term, or at light levels higher than 50 lux. Exhibit duration should never exceed six months.

While all paper objects are sensitive to light, the degree of the object's light-sensitivity depends on the nature of the materials and media. For example, "groundwood" paper quickly turns brown and brittle, its chemical deterioration from inherent-vice being accelerated by exposure to light. Rag fibers are fairly stable, but even rag papers may be stained or bleached by exposure to light, depending on the properties of the sizing.

Most colored materials found in paper objects are made with dyes, and fade quickly when exposed to light. Examples are colored papers, colored pencils and crayons, ballpoint and felt-tip pen inks. Watercolors are especially sensitive because the medium contains little dye or pigment. Some paper objects on which the image has been photographically produced, such as blueprints and sunprints, fade quickly when exposed to light.

If a paper object has been uniformly exposed to light, it has probably faded or discolored uniformly, making it difficult to tell that a change has taken place. If the object has been partially covered with a mat, sometimes you can tell the paper or the media has been altered by comparing the area under the mat where the paper was protected from light to the area exposed to light by the mat window. However, the comparison may be complicated if the mat is of poor quality materials and has itself stained and contributed to the deterioration of the object.

In general, design media which are pure minerals such as graphite, white chalk, and red chalk, and media based on pure carbon such as charcoal, India ink, and most black printing inks, are fairly stable in light. Objects made with these stable media are more likely to be limited by the paper's sensitivity to light. For example, a white chalk drawing on blue paper: in this case, the white chalk is not sensitive to light, but the blue paper is sensitive. Only a very low light level and a short period of exposure is acceptable for this object. If the paper and the media are relatively stable in light, the object can be exhibited at the maximum light levels and for the maximum time allowed for paper objects. For example, this would be appropriate for most objects made with black printer's ink on rag paper (e.g., an 18th

century broadside). Such items might appropriately be displayed at maximum light level for maximum time period allowed for paper objects, (i.e. six months at visible light levels of 50 lux [5 footcandles]).

d. Gaseous Pollutants and Dust

Gaseous pollutants (e.g., oxides of nitrogen and sulfur) transformed into acids, are very damaging agents to paper objects. "Groundwood" papers are especially vulnerable. Formaldehyde, given off by plywood, pressed wood, some foams and other synthetic materials, cause conditions that lead to serious deterioration of paper. Gaseous pollutants are especially damaging when the relative humidity is high and the object is exposed to high levels of light.

The affect of dust on paper objects depends on the composition of the dust. Sharp particles, such as sand and sea salt, abrade paper and design media as they are dragged across the object's surface. Oily particles from engine exhaust, cigarette or cooking smoke may become embedded in the paper fibers, soiling the paper and providing food for mold and insects. If the dust is acidic or contains metal particles, it accelerates the chemical deterioration of the paper. Because of paper's fibrous and absorbent nature, dust contamination can cause irreversible deterioration. Surface dust usually can be reduced, but rarely can be removed completely.

2. Acidity

Acidity is the primary cause of paper deterioration. It causes paper to become weak, brittle, and stained. The sources of acid in paper include:

- a. Materials used in the papermaking process, especially from 1850 to the present (e.g., alum-rosin sizing, groundwood pulp)
- b. Residual bleaching chemicals, inks (e.g., iron gall ink), and air pollutants (e.g., sulfur dioxide)
- c. Direct contact with acidic materials (e.g., file folders, adhesives, mat boards, unsurfaced wooden backings, unstable plastic sheeting)
- d. Exposure to acidic vapors from a closed document box or wooden file drawer

It is important to note that acid migrates. The ability for acid to move from an acidic material to an object of reduced or no acid is called "acid migration." The rate of acid migration is dependent on the moisture present; it is increased in humid conditions and slowed in dry conditions.

The concentration of acid is measured on the pH Scale - an arbitrary scale with numbers ranging from 0 to 14. The number 7.0 on this scale indicates that the pH of the material is neutral. All numbers below 7.0 indicate an increasingly acidic condition. All numbers above 7.0 indicate an increasingly basic or alkaline condition. A high alkaline condition also can cause paper to deteriorate. The pH Scale is logarithmic (e.g., a paper object with a pH 3.0 contains 10 times as much acid as an object with a pH 4.0 and 100 times as much acid as paper with a pH 5.0). The pH of most paper objects found in collections is in the acidic range below 5.0. A more desirable pH range is 6.5 to 8.5.

3. Molds and Pests

A complete description of the characteristics of the molds and pests listed below are included in Chapter 5, Section B of this handbook.

a. Molds

Molds grow on any material that provides moisture and organic nutrients. Molds literally destroy the sizing in paper and very often cause patches of staining or discoloration. Molds thrive in damp environments (e.g., a relative humidity level of 65% or higher), especially with still air.

b. Insects and Rodents

The most destructive pests for paper objects are bookworms (larval stage of the drugstore beetle and cigarette beetle), silverfish, cockroaches, booklice, common fly, and the house mouse. Powder in small round holes is an indication of an active infestation of bookworms. Silverfish eat completely or partially through paper. Look for their damage particularly in undesigned areas of prints and watercolors. Cockroach feeding on paper leaves ragged edges of paper and cardboard. Damage by this insect also can be caused by excrement. Booklice feed on mold. While not causing direct harm to paper objects, they are an excellent indicator of a mold infestation.

The common fly does not feed on paper or adhesives. However, this insect seeks shelter in books or framed paper objects. It leaves acidic excrements that are corrosive to paper.

The house mouse can damage or destroy large collections of unprotected papers. Look for their nests by observing the concentration of droppings.

D. PREVENTIVE CONSERVATION

A program of basic preventive maintenance carried out by park curatorial staff is the most cost effective approach to the care of large paper collections. A preventive conservation program includes the following elements:

- Performing non-interventive treatments
- Monitoring and controlling the environment
- Using appropriate housing and storage techniques
- Practicing conscientious handling and exhibit techniques
- Assessing the condition of the collection

1. Non-Interventive Preservation Treatments

The first step in preventive conservation for paper objects is non-interventive maintenance that can be performed by park curatorial staff. This step, critical to stabilizing an object's condition, includes removing any foreign materials that are damaging or jeopardizing the object (if removing them will not in itself damage the object) and placing the object in a safe environment. The goal is to slow deterioration as much as possible, while taking very limited action. Whether it is the only step taken to improve the object's condition, or merely the first step in a program, stabilization is one of the most effective means of preservation. By practicing this level of preventive conservation, park curatorial staff will improve the conditions for the maximum number of objects at the least cost in time and materials.

In organic archival collections, the order and relationship of the papers often is important and must be preserved by the curatorial staff. This principle is discussed in the NPS Museum Handbook, Part II, Museum Records. In such collections the staff must consider the intellectual arrangement of the materials as well as preservation concerns when preparing papers for storage.

Examples of non-interventive stabilizing measures are discussed below. Many of the materials needed for these measures will be described later in this chapter.

- a. Examining a box of documents to identify the mediums and note the condition of objects (e.g., insect damage, surface dirt, staining, yellowing, tears, embrittlement).
- b. Papers that have been stored exposed for some times often are covered with a layer of dust. Curatorial staff can use a soft artist's or cosmetic brush to gently remove the loose dust before handling and storage. Any more in-depth cleaning should generally be left to a conservator.
- c. Archival papers are generally removed from their soiled or acidic folders for long-term storage. File names and other labels are carefully copied onto new, acid-free folders; the old folders are

retained if they contain any annotations that cannot be transcribed, such as sketches. The papers are transferred to the new folders. Take care not to overfill the folders. The more fragile or valuable the papers, the fewer should be stored together in one folder.

- d. Store folders of documents horizontally or parallel to the shelf surface whenever possible, especially if the documents are fragile or brittle. Documents placed in flip top document boxes or print boxes can be laid flat on shelves to fully support the papers. See Section 4 "Storage Enclosures and Supplies" below for a discussion of storage box types.

Documents that are in good to fair condition and without high intrinsic value can be stored vertically, e.g., in records storage boxes (see below). If documents are foldered and stored vertically, ensure that the folders are fully supported by filling the box with loosely packed folders, or by filling extra spaces with crumpled acid-free tissue, or cardboard inserts. Do not allow the folders to slump or curl in the box, or pack the folders too tightly to handle gently.

- e. When archival files are placed in permanent storage, the original fasteners, including staples, paper clips, string ties, rubber bands, brads, and straight pins, should usually be removed. This is especially important when metal fasteners are corroded, when the attachments distort the shape of the documents, or when research use can result in damage, such as in producing photocopies. Fasteners can usually be removed by the park curatorial staff, although fasteners should always be left in place if removing them will damage the documents or their historical integrity. Consult NPS Conserve O Gram 21/4, "Removing Original Fasteners from Archival Documents," before removing any original fasteners from archival documents. The Conserve O Gram describes special techniques for removing rusted fasteners and protecting fragile paper during removal. It cautions never to use staple removers.

If fasteners are removed, it is important to maintain the order and relationship of the documents. Unattached documents in files can become disordered by researchers. In small collections of valuable documents, such as manuscript collections, each single-sheet or multi-page document can be stored without fasteners in its own acid-free folder. When this is not feasible, archivists and archival conservators propose several methods for maintaining the arrangement of previously attached groups of sheets. Different methods will be found appropriate in different situations. See NPS Conserve O Gram 21/5, "Attachments for Multi-Page Historic Documents" for a discussion of these methods.

- f. Removing the deteriorated rubber band from around a roll of drawings, and placing the roll of drawings in an acid-free tube. This process halts damage to the paper from the sulfur-containing

rubber band, and protects the drawings from dust and from being torn at their exposed edges. Consult NPS Conserve O Gram 21/4, which discusses removal of ties and rubber bands, including those that have deteriorated and stuck to the paper. If the sticky residue from rubber bands does not readily come off, the paper will need to be interleaved or covered with silicone release paper to keep it from sticking to other papers or storage containers.

- g. Removing a faded blueprint from a sunny exhibit wall, and placing it in a polyester folder in a dark storage drawer. This action arrests the fading and prevents further exposure to light. The polyester folder is chemically inert, and protects the paper from being torn during handling.
- h. Removing a stained print from its acidic mat, and placing it in an acid-free folder. This removes the foreign source of acidity. If the print is glued to the mat, or if the mat is glued to the backboard, the print should not be removed. Removing materials that are adhered to the object goes beyond stabilization. Note this condition for future treatment by a paper conservator.
- i. Some dissimilar objects are best separated from other materials or relocated, even in organic collections. If objects are moved, the staff must note both the object's orginal location and the new, so that the relationship of the documents remains clear. For example, photographic negatives are often removed from a series of papers and stored with other negatives in individual sleeves. If this is done, complete and insert a "Separation Sheet" such as the form in Figure J.1 in place of the negative.

Photographic prints in organic collections can be sleeved and left in place, or a photocopy of the print can be inserted in its place and the photo relocated to a print collection, again, in its own sleeve. Note on both the photo enclosure and the photocopy the print's former and new location.

A newspaper clipping enclosed with a letter must be sleeved or interleaved if left in place, to ensure that its acidity is not transferred to adjacent papers. The clipping can also be photocopied and removed for storage elsewhere. Some archives do not retain unannotated original clippings because their high acidity makes them difficult to preserve; this is a curatorial decision.

In this way incompatible materials can be isolated by barriers (such as sleeves or interleaving sheets), or by planned rearrangement, for preservation reasons, while still preserving the papers' relationships. In collections not considered to have a significant order, such as some manuscript collections, the arrangement can be altered to best suit the collection's preservation needs.

- j. Papers that are folded, such as correspondence, should usually be carefully unfolded for storage, provided they are supple enough to be opened safely. Flat storage is generally preferred for rolled papers small enough to fit in map case drawers. Papers that resist unfolding or unrolling can sometimes be opened safely and flattened for storage by controlled exposure to high relative humidity. NPS Conserve O Gram 13/4 describes procedures for humidification and flattening. Note: This procedure must be carried out with care as it is more interventionist than other procedures described here. If the papers are damaged or embrittled and in danger of cracking, request the assistance of a paper conservator before attempting to open them.

**NATIONAL PARK SERVICE
SEPARATION SHEET**

ARCHIVES

(Park Acronym)

Type of Item (map, newspaper, artifact, etc.)

Description of Item

Item Originally Filed (specific location)

Item Now Filed (specific locations)

Separated By

Separation Date

Figure J.1. A Sample Separation Sheet¹

2. Museum Storage Environment

a. Temperature

The optimum temperature varies depending on the materials and physical format of the object. The range 60°-70°F is acceptable for most objects found in paper collections. If a variety of objects are to be housed in one environment, maintaining levels within this range is recommended.

b. Relative Humidity

The acceptable level of relative humidity also depends on the materials and physical format of the object. A stable relative humidity within the range of 45-55% RH is acceptable for most objects in paper collections.

While biological infestation is encouraged by high RH, it cannot be controlled solely by maintaining an acceptable relative humidity level. Appropriate housekeeping is also critical to the control of pests. Refer to Chapter 5 of this handbook for guidance on pest control.

If there are museum storage spaces with separate environmental controls, the particular needs of the objects may be matched to the storage environments. For example, rolled or bound objects, which require flexing in handling, are more safely handled at a higher RH than at a lower RH within the acceptable range. Objects that will not be handled can be safely stored in areas with lower RH.

c. Light

The standard for exhibition of paper objects limits the exposure to six months at visible light levels of 50 lux (5 footcandles) or less for most objects (e.g., black-and-white prints, pencil drawings on rag paper, and watercolors). The UV radiation level must not exceed 75 microwatts/lumen in exhibit areas. During the exhibit period, turn lights off when no one is in the exhibit area for a sustained period. The standard for visible light in museum storage spaces is darkness when the space is unoccupied.

d. Gaseous Pollutants and Dust

Where practical, protect paper collections by housing storage spaces as far as possible from loading docks, lots, photocopying machines, and other ongoing sources of pollutants. Protect objects from predictable exposures. For example, remove paper objects before museum storage spaces are repainted. Do not place paper objects in painted exhibit cases until the paint has thoroughly dried.

Control dust by an appropriate ventilation system, filtering particulates from the air before they settle on surfaces. Implement good housekeeping practices (e.g., dusting and vacuuming). In removing dust that has settled, it is critical to actually capture the dust and not just redistribute it.

3. Pests

Establish an Integrated Pest Management (IPM) Program in spaces that house museum collections. Refer to Chapter 5 for guidance on a museum IPM program. Inspect all incoming collections for evidence of pest activity. Take the time to look at each object and its enclosure material for any signs of active insect or mold infestation. Periodically inspect the museum space and adjacent spaces and drawers, shelves, and boxes. Practice good house-keeping. If pest activity is discovered in the space, but not in the collection, increase the monitoring phase of the IPM program. If infested objects are discovered, immediately isolate them from the museum collection and take the action outlined in Chapter 5, Section D.

4. Storage Enclosures and Supplies

Within the storage space environment, the paper object's most immediate environment is created by the enclosures in which it is housed. As stated in Chapter 7, the purpose of the housing system is two-fold: it facilitates the physical organization of the collection and it provides an environment that is as clean and safe, chemically and physically, as possible.

Appropriate housing is especially important for paper objects if environmental control measures are less than ideal. The same materials used to make paper are used to make acid-free folders and boxes. As previously described, cellulosic materials respond to changes in the environment: taking in moisture when RH rises and releasing moisture when RH drops. Housing enclosures like folders and boxes help to protect the enclosed objects to some extent from abrupt changes in RH. In addition, closed boxes and drawers help to protect the objects from dust and other particulates.

Depending on the variety of paper objects within the collection, the housing system can include a variety of enclosures. Few parks have the luxury of starting from scratch to design a state-of-the-art system tailored to their collection. Sometimes curatorial staff is limited to commercially available products compatible with historic furniture that may or may not have artifactual value itself. However, there are basic principles to guide a park staff's efforts in providing the best housing and storage possible. These principles focus on supply materials, supply formats, and supply sizes.

a. Supply Materials

Because an enclosure is in prolonged and direct contact with the object, it is critical that the enclosure be made of materials that will not damage the object. To ensure this requirement, housing enclosures are usually required to meet certain specifications.

Specifications and methods of testing materials may change over time. At the National Archives and the Library of Congress, staff scientists and conservators continue to test and develop standards for materials to be used near paper objects. The Conservation Analytical Laboratory of the Smithsonian Institution also has research facilities and a technical information service that provides information on request. The Curatorial Services Division, WASO, acts as a Servicewide clearinghouse on information about appropriate museum collections storage materials. Refer to the NPS Tools of the Trade for a list of types of and sources for enclosures used to house paper objects.

In general, materials used to make enclosures must be non-abrasive and buffered (alkaline) or chemically neutral. Specific requirements have been developed for paper and plastic, since these materials are most commonly used to make enclosures for paper objects.

1) Paper

All paper products used to make housing enclosures, (e.g., sleeves, boxes, folders), must be free of acid, lignin, alum, and sulfur. Parks that order enclosures directly from a vendor should include this specification in the purchase order. Acidity is the most easily detected. Acidity is measured in units of pH ranging from 0 (very acidic) through 7 (neutral) to 14 (very alkaline). To test archival supplies for acidity, refer to NPS Conserve O Gram 13/3, "Determining the pH of Paper." The paper's pH can be manipulated during manufacture by loading or "buffering" the paper with alkaline salts, usually calcium carbonate. Storage materials described as "buffered," are commonly expected to be in the pH 8.5 range. Alkaline salts act to neutralize acid, thereby protecting the paper from attack by acid in the environment. The amount of protection depends on how much of the buffering salt is present and the acidity level of the enclosure.

The pH indicator strips described in NPS Conserve O Gram 13/3 are manufactured by E. M. Science, 480 Democrat Road, Gibbstown, NJ 08027, and are available from most archival suppliers. An initial neutral (pH 7) or alkaline pH is no guarantee that the paper will not become acidic in the future. Some storage envelopes sold many years ago as "archival quality acid-free" are now very acidic. These enclosures were made of groundwood paper and then buffered to

achieve an initial high pH. As the paper has aged, the lignin has generated enough acid to deplete the alkaline buffer. Testing for lignin specifically, or more generally for groundwood, is advisable even if the paper is acceptable in pH, to ensure that the paper will not become acidic in time. A spot testing kit is available to test for acidity, alum, and groundwood. The "Tri-Test Paper Testing Kit" can be used without special training and is available from Applied Science Lab, Inc., P.O. Box 24329, Richmond, VA 23224.

Paper products made exclusively of cotton fibers are often described as "100% rag". Products may also be described as "lignin-free", and "pure alpha-cellulose". Alpha-cellulose is the type of fiber left after lignin is removed chemically from woodpulp. None of these products are expected to contain lignin, but all of them should be tested.

A positive alum test (using the Tri-Test Paper Testing Kit), indicates the use of alum-rosin sizing. Like lignin, alum-rosin sizing causes the paper to deteriorate as it ages. Sulfur may also be present. Particularly harmful to silver, sulfur is also damaging to paper. Enclosures testing positive for alum or for sulfur should not be used to house paper objects.

Buffered vs. Unbuffered Paper Products

Most acid-free paper products available today are described as either "buffered" (usually around pH 8.5) or "unbuffered" (neutral or pH 7). When they are described only as "acid-free" a more specific term must be requested. Each type is appropriate in specific circumstances, depending on its specific chemical characteristics and those of the objects to be housed.

Buffering can be expected to prolong the life of the enclosure itself in an acidic environment. As long as it is alkaline or neutral in pH, the enclosure will protect the object from the acidic environment to some extent. Contact with a buffered enclosure will not raise the pH of the enclosed object. It extends the life of the object by neutralizing acid breakdown products and will prevent the acidic object from contaminating others. For example, buffered tissue paper used to interleave paper objects extends the life of the papers in contact with it. It will have little effect on papers more than two pages away.

Certain objects such as blueprints, cyanotypes, sunprints and dye transfer prints are slightly acidic by nature, and are damaged if the pH of the objects is raised. These objects are adversely affected by alkaline conditions. Some water color pigments are also alkaline sensitive. Unbuffered (or

neutral) enclosures are therefore recommended for blueprints, cyanotypes, sunprints, dye transfer prints, and water colors. Buffered enclosures are generally acceptable for all other types of paper objects.

To date, large acid-free map folders and acid-free tubes are available only in buffered stock, unless neutral folders are custom ordered. Buffered folders may be lined with polyester film for objects requiring a neutral environment, such as blueprints, to prevent the object from contacting the buffered paper. A sheet of polyester film may also be used to cover the face of the object.

2) Plastic

All plastics used in housing enclosures for paper objects must be chemically inert. Acceptable plastics include pure polyesters, polyethylenes, and polystyrenes that are free of powders, coatings, plasticizers, and other additives.

Unacceptable plastics include all polyvinylchlorides, informally called "vinyl" and "PVC". This material is widely used commercially. It can be found on most 3-ring binders, many plastic page protectors and multi-pocket sheets, in albums. Polyvinylchloride is inherently unstable. As it deteriorates, it can soften and stick to objects, can cause objects to soften, ballpoint pen inks to bleed, and other kinds of damage.

Information on the exact composition of plastics should be available from the distributor. Unfortunately, testing incoming housing enclosures to confirm this information is more complicated with plastic than with paper. Precise identification can require burning and chemical tests. These tests should be done only by trained staff under controlled conditions and with the most conservative safety precautions.

Undesirable chlorine-containing polymers, such as polyvinylchlorides, can, however, be quite simply identified using the Beilstein test. A copper wire, (e.g., 12 or 14 gauge) is held in the blue section of a gas or alcohol flame until it is red hot and the flame burns clear. The hot wire (cooled until it is no longer red hot) is then touched to the polymer in an inconspicuous place, since it will mar the plastic. Immediately return the wire to the flame. If the flame produces a green color, chlorine is present. (See CCI Note 17/1, "The Beilstein Test", for further information.)

More general identification of obviously unacceptable plastics can be accomplished by visual inspection and comparison to known examples. You can compile your own set of samples: most distributors will supply a sample housing enclosure on request. A readymade kit of labelled samples,

such as "Caveman Chemistry of Plastics", can also be very useful for comparison to sample enclosures. This kit includes samples and descriptions of various plastics, and is available for a nominal fee from Taylor Made Company, P.O. Box 406, Lima, PA 19037.

Polyester film is the plastic most commonly used in housing paper objects. It is one of the most dimensionally stable and chemically inert plastics available.

It is important to note that objects with powdery or friable media, such as charcoal or pastel drawings, some drawings or documents in graphite pencil, or any object with cracking or peeling media, should not be exhibited or stored in plastics. The plastic's static charge can attract the loose media.

b. Supply Formats

The second basic principle is to provide housing in the enclosure format which is most appropriate for the object. A familiar generalization is that mats are the enclosure of choice for works of art on paper and folders for archival records. In fact, either of these as well as other types of enclosures may be suitable for art, archival records, and other types of paper objects.

The appropriate format of the object's enclosure is determined by its physical needs. These in turn are determined by considering the format of the object, the media and materials used to make it, and its condition. Examples of each are as follows:

Format:

- flat single sheet (e.g., letter, print, manuscript map)
- rolled single sheet (e.g., architectural plan, map)
- bound set of sheets (e.g., pamphlet)

Media and Materials:

- charcoal on rag paper (e.g., drawing)
- printers ink on groundwood paper (e.g., newspaper)
- ink, watercolor on tracing paper (e.g., architectural drawing)
- ink on bond paper (e.g., letter)
- typewriter ribbon ink on bond paper (e.g., office correspondence, report)

Condition:

- **GOOD:** intact and structurally sound
- **FAIR:** damaged but structurally sound (e.g., waterstained)
- **FRAGILE:** intact but structurally unsound (e.g., brittle), or damaged and structurally unsound (e.g., torn, missing parts)

- **POOR:** actively deteriorating (e.g., groundwood paper, flaking paint, mold, contact adhesive residues)

Because paper objects are very vulnerable to physical damage such as tearing, the housing must fully enclose and support the object. Store smaller paper objects in folders in boxes or drawers. Within the folders, protect fragile objects within a second enclosure (e.g., polyester folder) or by interleaving.

Store flexible oversized paper objects rolled over an acid-free tube at least 3" in diameter and inserted within a larger tube. Oversize paper objects that are rigid or brittle are very difficult to house safely and usually require special arrangements.

Store most paper objects horizontally. Small flat objects (e.g., letter size manuscript materials) in good or fair condition, may be stored vertically in insulated file drawers and document boxes. This method is acceptable only if the objects are fully supported by protective housing enclosures and are not permitted to sag or protrude from protective folders.

Specific Types of Enclosures for Paper Objects

Descriptions of some types of enclosures and appropriate contents are as follows. (Note: All dimensions are in inches.) This is only a selection of enclosures; other suitable enclosures are also available.

Hybrid enclosures may be made by combining these as appropriate for particular types of objects. For example, a very brittle drawing which is frequently requested by researchers may be housed between two pieces of rigid acid-free matboard to support it physically, with a sheet of polyester film to protect its face from abrasion without obscuring the image.

- 1) **10 point and 20 point paper folders.** These folders range from the weight of standard file folders (10 point thickness) to what are generally called "map folders" (in 10 point and 20 point thicknesses). The 10 point folder is most often used in letter (10"x12") and legal (10"x15") size folders, and may be used in larger size folders. 20 point stock is most often used in folders over 20"x24". Being stiffer, the 20 point folder provides more support to the object and is easier to handle. In either thickness, folders are used to physically support the weight of the objects. Since the folders are flexible, they are appropriate only for objects that may be flexed without damage. Brittle or rigid objects may be housed in folders with added support. (See corrugated paperboard.)

- 2) **20 lb. paper folders.** These lightweight paper folders are used within the heavier 10 point paper folders, to protect fragile documents stored vertically in document boxes. Paper objects stored vertically tend to slip down in an enclosure and are especially vulnerable to damage at the bottom of the folder. These enclosures protect the bottom edge of the objects, and can be used to separate objects with ragged edges and those that vary in size. In addition to providing physical protection, the folders can be used to preserve archival arrangement without attaching fasteners to the objects. Refer to NPS Conserve 0 Gram 21/5, "Attachments for Multi-Page Historic Documents." They are appropriate for single sheets and sets of sheets in good condition.
- 3) **20 lb. paper interleaving sheets.** Interleaving sheets are placed between the objects within a folder. Like the 20 lb. paper folders, interleaving sheets prevent the objects from abrading or otherwise damaging each other, and can be used to preserve archival arrangement. They are appropriate for segregating paper objects in good condition such as separating a letter from a newspaper clipping to prevent acid migration.
- 4) **Polyester enclosures.** These enclosures are available in a variety of weights and seal configurations. Thicker films (e.g., 3, 5, and 10 mil) are stiffer and more easily handled than thinner films (e.g., 1 mil), and are preferred for objects larger than 10"x15" or wherever the extra volume can be accommodated.

The enclosures may be sealed on one or more of the four sides. Each side that is sealed increases the support and protection afforded by the enclosure.

Polyester films build up a static charge. This charge can be an advantage: it helps hold thin paper objects together within the enclosure, and helps keep unsealed enclosures closed and the objects from slipping out.

Caution: Fragile objects are vulnerable to tearing as the enclosure is opened. When the two sheets of polyester are separated, their static charges pull the object in opposite directions. If one area of the object is attracted to the top sheet and another area of the object is attracted to the bottom sheet, the object can be pulled apart, especially if it is already torn or has ragged edges.

As mentioned above, media that are powdery (e.g., charcoal, chalks, pastels) or are flaking (e.g., dessicated paint, inks) can be pulled off the paper surface by the static charge. Do not use polyester enclosures for objects with powdery or flaking media.

- a) **Polyester folders.** These folders are sealed on one side, usually lengthwise. Also called "processing folders", these enclosures are appropriate as temporary housing for fragile single sheets being processed (e.g., cataloged or treated), and to protect single sheets during handling by a researcher.
- b) **Polyester L-seal pockets.** These enclosures are sealed on two adjacent sides, providing more support than the polyester folder. The object must be put into the enclosure very carefully to avoid damaging it as it is inserted into the sealed corner of the enclosure. These enclosures are appropriate for thin pamphlets, for single sets of sheets in fragile condition, and for single sheets of groundwood paper.
- c) **Polyester sleeves.** These sleeves are sealed on two opposite sides, usually the long sides. In small sizes (e.g., 10"x15") and when used with a tight fitting rigid insert (e.g., 2- or 4-ply matboard), these enclosures are appropriate for thin objects that cannot be flexed, (e.g., placards and photographs).
- d) **Polyester 3-seal pockets.** These enclosures are "open-short" or "open-long", depending on which one of the four sides is left unsealed. An open-short pocket provides more support than an open-long pocket and is usually preferred. These are appropriate for thick pamphlets and bulky objects, and with rigid inserts for objects which cannot be flexed.
- e) **Polyester multi-pocket sheets.** These sheets are available in various sizes with pockets that vary in size depending on the number of pockets per sheet. They minimize the storage volume required by objects that are less than half as big as the standard size in which they are to be housed. For example, advertising cards are to be stored with related records in 10"x15" document boxes. Eight 3"x4" cards can be stored in a multi-pocket sheet, taking up a fraction of the space they would require if stored separately. These enclosures are appropriate for single sheets and sets of sheets in fragile to good condition.

Enclosures like these can be made by sealing two sheets of polyester together with ultrasonic vibration, with heat, or with double-sided pressure sensitive tape. The ultrasonic and heat seals are preferred. The commercially available polyester enclosures listed above are made with ultrasonic or heat seals in standard and custom sizes. Parks with large paper collections may wish to purchase ultrasonic or heat-sealing equipment to make their own enclosures.

If tape is used to seal polyester, exercise care applying the tape to ensure that the object does not come in contact with the tape's adhesive. There is only one double-sided tape that meets the standards for archival quality (established by the Library of Congress Research Office): 3-M Scotch Brand Double-coated Tape No. 4150. This tape is made up of an acrylic adhesive on a polyester film carrier. It is acceptable only for use in making enclosures. Never use tape directly on the paper object.

- f) Encapsulation. Another technique that can be used to house objects in plastic is known as encapsulation. In this enclosure all four sides of the enclosure are sealed to create a capsule, with the corners left open to permit air circulation. Procedures for encapsulating documents are provided in NPS Conserve 0 Gram 13/3.

Encapsulation may be appropriate for extremely brittle documents, or documents already torn or crumbling, particularly those that are handled frequently for research use. Some museums also encapsulate documents sent off site on loan, specifying that the object must be maintained in the capsule until it is returned.

Ideally, acidic documents should be deacidified by a conservator before they are encapsulated long term. Research has shown that when acidic documents are encapsulated, the aging process is accelerated. The procedure may thus be undesirable unless the objects are frequently handled, or severely deteriorated.

For acidic documents or works of art done only on one side of a sheet of paper, a sheet of buffered tissue placed behind the object within the capsule appears to offset the build up of acidity.

- 5) Matboard enclosures. A variety of enclosures can be made with museum quality matboard. Instructions for mounting paper objects in standard mats are provided in NPS Conserve 0 Grams 13/1 and 13/7. Instructions for preparing variations on the window mat are available from the Preservation Office of the Library of Congress.

The basic window mat is made of a backboard, to which the object is attached with paper hinges or corners. The backboard is hinged with gummed cloth tape to a window mat, through whose window the object is visible to the viewer. This is appropriate for objects being framed for exhibition. In combination with an interleaving sheet of non-abrasive acid-free paper such as glassine, window mats are also appropriate for storing objects with media which must not be touched by the housing enclosure (e.g., powdery or flaking media).

Matboard is available in various thicknesses, most commonly 2-ply, 4-ply, and 8-ply. It is usually somewhat flexible. Small pieces are rigid enough to provide physical support for small brittle objects.

Matboard cut to standard sizes can be used within other enclosures to provide extra physical support. Within polyester sleeves, the matboard provides the rigidity necessary for small brittle objects. Within document boxes, matboard may be used to separate different size objects and prevent the uneven distribution of packing pressure within the box. Cut larger than the standard size, matboard is an appropriate handling support for flexible objects.

- 6) **Corrugated paperboard.** Similar in its uses to matboard, corrugated paperboard is much stronger. It can also be used to evenly distribute the weight of different size objects within boxes and as a handling support.

Single walled corrugated paperboard can be creased and folded to some extent, and used to make spacers to customize standard size boxes to fit odd-size objects, to divide map case drawers, and to make wedges to fill space within document boxes. Single walled corrugated paperboard tends to warp in large sizes. The double walled version does not warp, and is stronger than the single walled. It cannot be folded, but is useful as a rigid support for larger or heavier objects.

- 7) **Boxes.** Boxes are available in a variety of designs for vertical and horizontal storage of objects. Box descriptions can be confusing. The style names of boxes often refer to a specific use (e.g., shoe box, suit box), although the box may be appropriate for other types of objects. Different manufacturers may call the same box by different names.

Boxes are appropriate for objects in enclosures (e.g., mats, folders) as well as for loose objects (e.g., three-dimensional paper objects, collections of catalog cards, index cards). The box should not be so large that it is too heavy or unwieldy to carry easily.

Consider using a number of smaller boxes rather than one large box to house a series of objects. Smaller boxes are easier to handle. In addition, breaking the series into a number of boxes will cut down on the number of objects that must be handled to retrieve a given object from its box.

All boxes should have covers so that they can be closed. Boxes with a drop-front are held closed by the box lid. When the lid is removed, the front can be dropped so that objects can be slid out rather than lifted out of the box. The

enclosures can fit very snugly, since room to reach into a drop-front box is not necessary.

- a) Document boxes are either used for vertical or horizontal storage of paper objects, again, ensuring that all papers are fully supported. Sizes vary, the most common ranging from 3"x5" up to legal size (10"x15"). The box has a hinged lid that swings up and behind the box. Objects are removed by lifting the enclosure up and out. The box may have a handle to facilitate pulling it off the shelf. String handles are acceptable if the ends are glued between the layers of the paperboard of which the box is made. Do not use handles that protrude into the interior space of the box (e.g., polyethylene straps hooked into holes in the box). These handles can catch on the enclosures and objects inside the box and can cause severe damage.
- b) Shoe boxes are also used for vertical storage of paper objects, such as index cards, bumper stickers and decals. These boxes have lids that fit over the top and extend down the sides of the box. "Telescoping" lids extend all the way to the bottom of the box and add to the strength of the box. Telescoping lids can be difficult to remove, especially from a deep box. "Short" lids are the alternative to telescoping lids, and are usually about 1-1/2" deep.
- c) Solander or clamshell boxes are used for horizontal storage of paper objects, usually in mats or folders. To store objects of varied sizes, the objects can all be housed in folders or mats with exterior dimensions cut to fit the interior of the box. The objects then are stored uniformly, and will not shift or slide in the box. These boxes are hinged so that the top of the box swings over to provide a continuous surface for handling objects. They are appropriate for the storage of works of art on paper.
- d) Shirt boxes and suit boxes are similar in style to shoe boxes, but are sized in different proportions, for horizontal storage of paper objects.
- e) Archival Records Storage Boxes are 10" x 12" x 15" boxes made of acid-free and buffered corrugated fiberboard or polyethylene. Hand holes are cut into either end of the box for carrying, and the short lid lifts off. These boxes are generally used for the vertical storage of papers housed in folders, and in good to fair condition. For this reason, they should not be used to hold fragile archival materials or those of high intrinsic value.

8) **Map Drawers.** Like boxes, map drawers are appropriate for objects in enclosures (e.g., mats, folders), as well as for objects that are not feasibly enclosed within the drawer (e.g., three-dimensional objects). Shallow drawers are preferred over deep drawers for storing objects in folders and mats. Shallow drawers provide the most efficient use of space, since stacks are usually limited to one inch in height. Refer to section on storage equipment for guidance. To provide a snug fit for a variety of standard sizes, fill in extra space in the drawer with spacers made of folded acid-free material such as folder stock, matboard or corrugated paperboard.

c. Standard Supply Sizes

One of the most important principles is to have a modular system of standard sizes. Standard size enclosures can be ordered in bulk, stored more efficiently and used more quickly than enclosures that are custom-sized to each object.

Whenever dimensions are given in supply catalogs, determine whether they are "inside dimensions" (I.D.) or "outside dimensions" (O.D.). The way the enclosure is measured becomes critical when combining enclosures made by different manufacturers. For example, 10"x15" folders should fit into a 10-1/4" x 15-1/4" box, but they may not unless the box was measured on the inside.

Paper is specified by weight: 20 lb. paper is similar to bond paper.

The thickness of heavier weight paper and cardboard is specified by point: 10 point paper is similar in thickness to an index card.

The thickness of polyester film is specified by mil: 1 mil polyester film feels similar in thickness to kitchen-grade plastic wrap.

In evaluating the specifications for a particular enclosure it is useful to have a collection of labelled samples of housing materials and enclosures. Most suppliers will send a sample of a particular product upon request. Selected supplies are available from the Curatorial Services Division, Harpers Ferry Office.

It is critical that the enclosures within each standard size fit snugly together. If the enclosures do not fit snugly, then the enclosed objects may not be fully protected. For example, if the folders within a drawer can slide around as the drawer is opened and closed, then there is room for the objects to slip out of their enclosures and become torn, crushed, and otherwise damaged.

When storing paper objects together in drawers or boxes, always house them in the same size enclosures. When different size enclosures are interfiled, the smaller enclosures cannot fully

support the larger ones, allowing the larger objects to sag and become distorted. Paper objects in the smaller enclosures may be overlooked or misplaced, or may slip out of their enclosures and become damaged.

Sometimes objects that vary in size must be interfiled for archival reasons. In such cases, the appropriate standard size is determined by the largest object, and all of the objects are housed in enclosures of that size. Always ensure that an enclosure is larger than the objects it contains.

5. Museum Collections Storage Equipment

Storage furniture is required to physically support paper objects within their housing enclosures. Ideally, the furniture will also afford protection from abrupt changes in the environment and pest infestations, and will maximize the available storage space. Refer to Chapter 7 for guidance on museum collections storage.

Unless documents are in very good condition, and are very well supported by their enclosures, they should not be stored vertically in file cabinets. Most paper objects can be accommodated with two basic kinds of equipment: shelves and map cases. Shelves are appropriate for storing objects in closed housings such as acid-free boxes and tubes. Tubes (with objects inside, not rolled around the outside) can be stacked in a honeycomb pattern to allow efficient arrangement of rolled items in storage. Modular storage units afford the most efficient use of space and the most efficient retrieval of objects.

Some boxes will tolerate being stacked, but most will gradually compress under the weight of the object above. Depending on the shape of the box and the weight placed on it, some boxes cannot be stacked at all, even temporarily, without damaging the objects inside. Even if the box is strong and designed to be stacked, if it becomes squashed, dented or otherwise damaged, it will not provide adequate physical protection for the objects inside.

Avoid stacking boxes whenever possible. If equipment shelves are adjustable, space them closely enough to allow each box to be placed directly on a shelf. If it is necessary to stack boxes, ensure that 1) the sides and top of each box are not creased or caved in, and that 2) each box is fully supporting the weight above it rather than allowing weight to rest on the objects inside.

Objects too large for boxes are appropriately stored within folders in map cases. Folders are usually stacked within each drawer. The weight on the bottom objects increases as more objects are stacked on top. Objects under heavy weight can be creased and compressed, and are vulnerable to damage during retrieval. Avoid stacking folders more than one inch deep. Less space is wasted if the drawers are shallow, e.g., 1-1/2" deep. Even if the drawers are several inches deep, the stacks of folders within them should not exceed one inch.

Store objects of varying sizes in uniform folders that conform to the size of the drawer. Drawers can be subdivided with acid-free paperboard to safely hold two or more stacks of folders or rows of rolled objects.

Like all materials used near paper objects, the storage equipment must be as chemically inert as possible. Objects stored in enclosed spaces such as storage cabinets and exhibit cases are especially vulnerable to damage from fumes given off by materials used to make the furniture such as wood, adhesives, gaskets, and paint.

Acceptable materials include galvanized steel, steel with a baked enamel finish, chrome finish, stainless steel, or anodized aluminum. In some instances with baked enamel finishes, components of the finish may not have been adequately cured in the manufacturing process. If an odor is noted in new closed cabinetry, allow the unit to air before use.

6. Handling

Historic objects are often in fragile condition, requiring more than ordinary care to handle them safely. At the same time, some people who use paper collections are concentrating on their particular project (e.g., research or finding an object suitable to exhibit) rather than careful handling. Others may simply be unaware of the damage that results from careless handling. It is imperative that each person who handles objects be trained, and take the time necessary to do it safely. **Note:** Damage from mishandling is preventable.

As stated in Chapter 6, a set of rules for handling objects is essential. Prepare a written set of procedures for handling objects, including paper objects; distribute them to appropriate park staff, and post them in a location that will serve as a reminder. Enforcing the policy may not seem easy, depending on the interpersonal skills of the curator and the person requesting an exception, especially when the procedures are new. Keep in mind that handling procedures are necessary to preserve the collections, and they only work if they are consistently enforced.

Chapter 6 outlines the general guidelines for ensuring object safety during handling and moving. One general rule needs to be emphasized when working with paper objects: **Never rush when handling objects.** The basic principles of safe handling are as follows: limit handling, provide a clean and uncluttered workspace, and provide each object with appropriate support.

- a. Limit Handling. One way to limit handling of objects in storage is to create inventories, container lists, finding aids and box and folder labels that eliminate the need to physically search through the housing enclosures. The number of people who handle an object should be limited as well. Handling of paper objects by researchers and park staff should always be overseen by a staff

person with collections responsibilities. Ideally, only trained staff should handle oversized papers such as maps or architectural plans.

If a limited number of paper objects is to be used by a researcher, they should be placed inside a rigid sealed enclosure or plastic sleeve to protect them from handling. Whenever use is frequent, facsimiles or duplicates should be used by researchers instead of original paper objects. Refer to NPS Conserve O Gram 21/3, "Archives: Preservation Through Photocopying" for guidelines on producing copies of original paper documents. This Conserve O Gram describes the kinds of documents that should be photocopied to preserve their informational content (e.g., Mimeograph or Thermofax copies that are deteriorating, brittle and deteriorating highly acidic papers, newspaper clippings) or that should be copied in order to preserve them from repeated handling by researchers or deterioration through exhibition. The Conserve O Gram also discusses the kinds of copiers, toners, and papers that should be used to produce stable copies.

- b. Clean and Uncluttered Workspace. Transport paper objects only within their protective housing enclosures (e.g., folders). If the object is to be removed from its enclosure (e.g., for examination by a researcher), provide a workspace that has a clean, flat and uncluttered surface. The general rule is to provide plenty of room to open the enclosure and remove the object.
- c. Appropriate Support. Paper objects require support of various types, depending on their format and condition. The purpose of supporting the object during handling is to relieve the object of the strain of its own weight. The support may be long-term, as provided by the object's housing enclosure, or may be temporary, as provided by a rigid paperboard on which an object is carried to the user.

Since the risk of damage is much greater when the object is being handled than when it lies undisturbed in storage, objects often require support during handling in addition to that provided by their housing enclosures. This principle is elaborated in the following section.

d. Specific Handling Techniques for Paper Objects.

Small paper objects that are sound structurally, intact and lightweight usually do not require additional support for limited handling. A manuscript letter on rag paper in good condition requires no more support for handling than its acid-free folder.

A fragile architectural plan on tracing paper is appropriately housed in a polyester encapsulation. It may be safely handled within the encapsulation.

Sometimes there is a need to handle paper objects directly (e.g., preparatory to properly housing them). Whenever objects are handled directly, they are particularly vulnerable to damage.

Always use both hands. Never hold an object by one corner; the strain on the object can cause structural damage. Instead, if it is a small object, allow the weight of the object to rest on your hands. Hold rolled objects similarly, with the weight of the roll resting on your hands. **Never grasp a rolled object:** it can easily be crushed.

When placing a brittle object on its support, it is usually safest, rather than lifting the object, to place the support on the same level as the object and gently slide the object onto it.

For rigid supports, lightweight materials such as corrugated paperboard are easiest to handle. These provide adequate protection for carrying objects by hand.

A closed support such as a portfolio (e.g., a rigid folder-style enclosure) provides more protection than an open support such as a tray or a piece of rigid paperboard. Make an acid-free portfolio from two sheets of archival corrugated paperboard, taped along one long side with water-activated linen tape. Any object carried in the portfolio should be in another enclosure (e.g., an acid-free folder or a polyester folder) for further protection.

Use a closed support when carrying the object outside of the building or through a route with tripping hazards or tight fits. An open support is usually adequate for limited handling such as moving an object from one table to another. **Handle the object by its support.**

Large rolled objects can be problematic to handle safely. In the best cases, the object can be unrolled without stress. More often, the object tends to curl up as it is unrolled.

If the object is brittle or dessicated, do not attempt to unroll it. These objects require treatment by a conservator before they can be viewed.

If the object is flexible, it often can be unrolled even if it tends to curl. Small weights such as 35mm film canisters filled with lead shot can be used to hold down the object's edges. The weights must be smooth and clean to prevent damaging the object.

If the object is too long for the available table space, it can be "scrolled". To scroll through a rolled object, unroll only as much as can be supported by the examination surface. After examining the exposed part of the object, re-roll the object from its free end. This gives you two rolls. Carefully shift the position of the object so that more of it can be unrolled. Unroll the next part of the object and proceed until all of it has been

examined. Be very cautious when unrolling objects: the edges of tears tend to spring apart and can cause the object to be torn further.

Objects being inserted into or removed from polyester enclosures are extremely vulnerable to tearing because of the static charge on the polyester film. To insert a limp or very lightweight object into a polyester enclosure, it is sometimes useful to use a sheet of 20 lb. acid-free paper as a temporary support. As you hold the enclosure open, insert the object on its support. Allow the enclosure to close, and very lightly rub the polyester film with a lint-free cloth (e.g., cheesecloth) to build up a charge directly over the object. Carefully slip the support paper out of the enclosure. The static charge should help to keep the object in place.

Watch very carefully and go slowly when removing an object from a polyester enclosure. If the enclosure is to be removed, cut through the polyester, carefully avoiding the object. The least strain is placed on the object if the seals are cut. Be extremely careful not to damage the object. If the object is being damaged, do not persist in removing it. It is better to sacrifice the enclosure, than to damage the object.

If the enclosure is open on at least three sides, remove the top sheet of polyester film by rolling it up. If the object is torn and the edges of a tear are not adhering to the same piece of polyester film, gently separate the errant edge from the film with a microspatula and hold it down to the appropriate piece of polyester while you lift the other sheet away.

If the enclosure is sealed with an L-seal, separate the top sheet by lifting its free corner before removing the object. If the enclosure is open on only one side, separate the pieces of polyester film at the edge of the opening by inserting a microspatula or other flat tool. If possible, insert a piece of acid-free paper to support the object as you remove it.

7. Exhibition

One of the greatest challenges is to find an acceptable balance between the benefits of exhibiting original paper objects and the resulting damage. For objects with high intrinsic value, there is no level of loss which is acceptable. For other objects (e.g., those with no intrinsic value that are duplicated in the collection), there may be a level of loss which is acceptable (e.g., fading of color which is imperceptible to the human eye).

Because of the risk to the object, six months is usually considered the maximum time for original paper objects to be placed on exhibit. For a permanent exhibit, only facsimiles are appropriate. It is important to distinguish facsimiles, which are new copies of the

original object, from original objects that exist in historical duplicates (e.g., lithographs, blueprints).

There may be some objects such as lithograph maps that exist in the collection in several identical copies. In some cases, it may be appropriate to treat one of these copies as a facsimile for exhibition purposes. Note: It is not appropriate to treat all historical duplicates as facsimiles.

Some paper objects that were created as duplicates may now be more appropriately considered unique objects. For example, there are working drawings (e.g., blueprints that were originally printed in multiple copies), that have annotations documenting plan changes made during the construction. Such working drawings are unique objects by virtue of the unique annotations. Other objects that may have once existed in multiple copies may now be considered unique by virtue of being the only extant copy.

There are measures that can be taken to limit the risk of exhibiting paper objects. The principles behind these measures are as follows: house the object with appropriate materials in the format that will best support the object and limit the object's exposure to harmful environmental conditions (e.g., temperature, relative humidity, light, air pollution) and to pests.

a. Exhibition Housing Enclosures

Paper objects on exhibition require special protection. Their housing enclosures must physically support them so that the display itself does not cause mechanical damage, and must protect them from direct handling and vandalism.

Exhibitions are sometimes designed to produce a visual effect (e.g., all objects are enclosed in identical mats and frames without considering the preservation of the individual objects). For the safety of the objects, design exhibition housings to satisfy the physical need of each object.

Most paper objects are exhibited in frames and/or in exhibit cases. Frames are most appropriate for single sheet objects (e.g., prints, drawings, manuscript materials) that are strong enough to be displayed upright. Cases are required for objects that cannot be safely housed in a mat (e.g., multi-sheet, large, thick or heavy objects).

As for all housing enclosures, the exhibition mats and mounts must be larger than the object to fully protect the object's edges. **Never fold or trim an object to fit into a housing enclosure.**

Refer to NPS Conserve O Gram 13/7, "Exhibit Mounting Variations for Objects on Paper" and NPS Conserve O Gram 13/1, "Conservation Framing" for technical guidance on mounts and frames.

1) Matting and framing

Ideally, overmat all paper objects that are framed. In an overmat, the window is smaller than the object so the mat covers the object's edge by at least 1/4" on small objects and proportionally more on larger objects. This technique prevents the object from popping through the window mat.

If it is not possible to cover the edges of the object (e.g., the image goes to the edge of the paper), "float" the object within its window mat, by centering it inside a window that is larger than the object and attaching with hinges.

Many objects, (e.g., broadsides, posters), that are desirable to float are not structurally sound enough to be hung within the mat by hinges. These objects may only be displayed in mats if they are first encapsulated, and the encapsulation, rather than the object itself, attached to the mat. Seal the polyester film within 1/8" of the edges of the object as usual, but leave large margins outside the seal. Cut the window of the mat to barely cover the seal. If the encapsulation is the same size as the mat, taping it to the mat to keep it in position may not be necessary.

If the encapsulation is smaller than the mat, use double-sided tape to hold the polyester film margins to the matboard. To remove the encapsulated object from the mat, simply trim the margins. If the object is to remain in the encapsulation for storage, the encapsulation should fit one of the standard sizes after trimming.

If the object is strong enough to be floated without being encapsulated, hinge it intermittently along all edges to prevent the paper from being attracted to the glazing. If the object is not strong enough to be hinged, and it cannot be encapsulated (e.g., a pastel drawing on brittle newsprint), do not display it upright.

In some cases (e.g., with some modern works of art on paper) a mat is not appropriate aesthetically. If a framed paper object is not matted, its mount must be rigid so that it will not bow in the frame, and the mount must be separated from the glazing with spacers. Encapsulation is usually not acceptable visually for framed objects without mats. In this case, hinge the object to the mount. As with objects floated in mats, hinge the object along all sides.

For an object housed in an historic mat and frame that must be retained (e.g., a decorative object in a historic room or house), substitute acid-free for acidic materials as much as is possible and appropriate for the particular object. In some cases, the design of a historic mat can be recreated (e.g., an acidic French mat, with modern acid-free

materials). An historic frame's wooden backing can be replaced with museum quality matboard or corrugated paperboard. Where historic parts cannot or should not be replaced, line them with acid-free materials (e.g., by placing a two-ply acid-free mat between the object and its acidic historic mat).

2) Exhibit Cases

Paper objects are sometimes displayed horizontally in exhibition cases, usually on unobtrusive exhibition mounts. The mounts may be made of any material that is appropriate for housing paper objects and strong enough to fully support the object (e.g., acid-free matboard and acid-free corrugated paperboard).

Unless the relative humidity within the case is rigidly controlled, paper objects will expand and contract continuously as changes in temperature cause the RH within the closed case to fluctuate. For this reason, unless the object is in a sealed enclosure, **the mount must be larger than and must not constrain the object.** Mounts that are the same size or smaller than the object and constrain it will damage the object as it expands.

If the object is displayed horizontally, it must be attached to its mount. If it is displayed at an angle, it also must be attached to its mount to keep it from slipping down gradually.

Hinge an object to its mount with the technique used to hinge an object to a mat. If hinging is not appropriate, hold the object to its mount with a sheet of polyester film wrapped around to the back of the mount. This is a sealed enclosure, appropriate only for objects that may be safely encapsulated.

Never hold the object with fishing line or with straps of polyester film. Both of these materials are unresponsive to changes in relative humidity, and can cut the paper if they expand. Although it appears to be transparent, polyester film blocks out some of the light falling on the object, causing differential fading under the straps if they cross the image area.

A rolled object may be partially unrolled for an exhibit within a closed case, and weighted to prevent it from curling up. Transparent weights such as pieces of acrylic sheeting or glass with rounded edges and corners are usually the least obtrusive. Like polyester film, these materials can cause differential fading and should not be placed over the image.

b. Environment

1) Temperature and relative humidity

Paper objects on exhibition are responsive to changes in temperature and relative humidity.. These agents are usually more difficult to control in exhibit spaces than in storage. Opening and closing doors circulate unconditioned air into the space. People add to the temperature with body heat and to the RH with perspiration and respiration. This effect can be very pronounced in the immediate area of an object which exhibition visitors study closely (e.g., an autograph). To protect the objects from abrupt changes in their environment, seal cases and frames as effectively as possible.

A sealed frame provides the enclosed object with some protection. If the glazing cannot be removed from the frame, both the glazing and the backboard should be sealed to the frame with plastic tape. If the glazing is not attached to the frame, make a sandwich with the matted object between the glazing and the frame backboard, sealed along all four edges with a plastic tape such as 3M's Magic Mend 810 (not for use in contact with paper objects) available through GSA. The sandwich is placed between the glazing and backboard and lowered into the frame in its entirety. Unframed objects may be sealed within a similar sandwich, in an encapsulation or in a hybrid enclosure, (e.g., between polyester film and 4-ply acid-free matboard).

It is possible to better control the relative humidity within a sealed exhibit case (e.g., with silica gel), if the outside environment is fairly stable. Refer to Appendix I, "Care of Archeological Objects," Section E for guidance on the use of silica gel. Historic exhibit cases can usually be repaired and sealed with caulking. Remember to remove the objects from the cases before starting any repair work. Most modern cases are designed with gasketing for a tight seal. Make sure the sealants, (e.g., caulking, gaskets), do not give off harmful vapors.

2) Light

Because the effect of light on paper objects is cumulative, the levels of light must be strictly controlled to acceptable levels and the length of time that the object is on exhibit must be limited.

50 lux (5 footcandles) is the maximum acceptable visible light level standard for exhibition of paper objects. While all paper objects are sensitive to light, they range from less sensitive objects (e.g., a print in black ink on white rag paper) to objects with colored paper or media such as

blueprints and watercolors. Exhibit paper objects at no more than 50 lux for no longer than six months.

Never expose objects to direct sunlight. Where sunlight is required (e.g., to recreate a historic interior, replace original paper objects with facsimiles). Even where it is possible to reduce visible light levels to acceptable levels, protect the objects from ultraviolet radiation by placing UV filtering material between the object and the light source.

Cover fluorescent bulbs with UV-filtering plastic tubes. Coat glass with UV-filtering film. Where acrylic sheeting can be used instead of glass (again, not recommended with friable media), in frames and in cases, ensure that it is the UV-filtering type. Refer to the NPS Tools of the Trade for sources of light controlling materials.

8. Monitoring and Reporting Condition of Paper Objects

Any time a paper object is viewed or handled provides an excellent opportunity to monitor and report on its condition. Handling objects for accessioning and cataloging, in preparation for research use, before and after an exhibition, and at any other time allows the curatorial staff to examine each object and assess its condition. Depending on the object's condition, the use for which it is being prepared may or may not be appropriate.

Viewing objects (e.g., on exhibit), usually provides less information than can be gained by actually handling an object, but a strictly visual inspection can be done relatively quickly and often combined with other tasks (e.g., monitoring the amount of light falling on each object in the exhibition).

There is a difference between a **technical examination** by which a conservator determines the materials, media, and methods of fabrication of an object, and the **condition report** that curatorial staff can use to document the condition of objects in the museum collection. In the Service, the Conservation Survey prepared by a conservator, is called a Collection Condition Survey. Refer to Chapter 3 for guidance on this survey.

The curatorial condition report, typically much briefer than a Collection Condition Survey, focuses on the overall physical condition of the object. The emphasis should be on recording any visible deterioration/damage at the time of inspection. Objects are inspected item-by-item, and the results are reported on the individual or group level. The group may be as small as two objects or as large as a series or the entire collection. The results reported on the individual or small group level may be summarized to provide information on larger groups or on the collection as a whole.

Monitoring and recording the condition of each object is considered **surveying at the item level**. This kind of report is especially appropriate for comparing the condition of the object before and after a given event (e.g., loan for a traveling exhibition). Figure J.2 provides a checklist that trained curatorial staff can use to document the condition of the object and its housing. Refer to Section G of this appendix for a glossary of terms used to describe the condition of paper objects.

Information on the collection's condition can also be gathered during projects that require handling, such as the rehousing of a group of objects. An example of a condition report for a group of rehoused records is given in Figure J.3 a-b. For this report, the objects are **inspected at the item level and reported at the group level**. The group is one document box of paper objects thematically described by the curator. The report records the total number of objects at the top left. This total is broken down along the left vertical column by type of object, and across the other columns by condition. The numbers are totalled by column and converted to percentages at the top to give information at the group level (e.g., how many items in the folder are torn).

As each document box of objects is rehoused, a report on the condition of the collection is generated. The report, which can be summarized to give information about the collection, gives information about the objects within each box. Information reported at this level is very useful in planning conservation projects ranging in scope from the smallest group of objects to the entire collection.

For large collections the condition of the collection may be estimated based on the inspection of a small number of objects in a **random sample survey**. The objects are usually selected by storage location using a number code for each location and a list of random numbers generated by a computer. This type of survey is the most efficient way to gather information on the condition of a very large collection.

Regardless of the number of objects inspected and the level of reporting, the condition must be consistently described according to precise definitions. Otherwise the information gathered and recorded will be very limited in its usefulness. It is critical that anyone who monitors the condition of paper objects be trained to recognize the different states of condition, and that the criteria for each category of condition be recorded. This approach ensures that:

- The results are reproducible (e.g., different people surveying the same objects will report the same information).
- The results are intelligible (e.g., anyone who evaluates the results will know what is meant by the descriptive terms used to record the condition of the paper object[s]).

PAPER OBJECT CONDITION REPORT

Object: _____ Accession No. _____ Catalog No. _____

Examined by: _____ Date: _____

Type of Object (e.g., booklet, broadside, letter, map, print): _____

Type of Mounting (e.g., encapsulation, matted): _____

Reason for Examination: New Accession Outgoing Loan/Transfer
 Pre-Treatment Returned Loan/Transfer
 Accidental Damage/Disaster

Signs of Deterioration Noted: Yes No (If yes, describe below)Active Deterioration Noted: Yes No (If yes, describe below)Object Needs to be Examined by a Conservator: Yes NoObject's Condition Photographed: Yes No**Signs of Deterioration Noted (Check Appropriate Conditions)**

<input type="checkbox"/> Accretions	<input type="checkbox"/> Discolored/Faded	<input type="checkbox"/> Hole	<input type="checkbox"/> Surface Dirt
<input type="checkbox"/> Abraded	<input type="checkbox"/> Discolored/Stained	<input type="checkbox"/> Loss	<input type="checkbox"/> Unraveling
<input type="checkbox"/> Burned	<input type="checkbox"/> Dessicated	<input type="checkbox"/> Tear	<input type="checkbox"/> Worn
<input type="checkbox"/> Break	<input type="checkbox"/> Fasteners	<input type="checkbox"/> Soiled	<input type="checkbox"/> Scratches
<input type="checkbox"/> Brittle	<input type="checkbox"/> Flaking	<input type="checkbox"/> Adhesive	<input type="checkbox"/> Plastic/Paper Tape
<input type="checkbox"/> Creased	<input type="checkbox"/> Insect Damage	<input type="checkbox"/> Residues	<input type="checkbox"/> Wrinkles/Draws
<input type="checkbox"/> Cockling	<input type="checkbox"/> Mold Damage		<input type="checkbox"/> Loose Parts
			<input type="checkbox"/> Other: _____

Comments (if appropriate, include additional description of condition)

Figure J.2. Curatorial Condition Report for Paper Objects

CONDITION OF PAPER COLLECTIONS: GROUP SURVEY REPORT

Material Surveyed: _____ Accession No. _____
Total Objects Surveyed: _____
Examined by: _____ Date: _____

Figure J.3a. Condition of Paper Collections: Group Survey Report

CONDITION OF PAPER COLLECTIONS: GROUP SURVEY REPORT

Material Surveyed: Smith and Co. Records Accession No. OZLO-4
 Total Objects Surveyed: 129
 Examined by: A. Jones Date: 5/7/88

Frequency		Faded	22%	Discolored	84	Brittle	10	8%	Soil	95	74%	Stains	69	53%	Adhesive, Residues, Tapes	61	47%	Creases	10	8%	Tears	13	10%	Losses/Holes	11	9%	Original Fasteners	9	7%	Added Fasteners	4	3%	Other:	4
	Advertising Card																																	
	Album/Scrapbook Page																																	
	Announcement																																	
	Ballot																																	
	Book																																	
	Booklet																																	
1	Broadside	1																																
	Bumper Sticker																																	
	Calling Card																		2															
2	Cartoon	1																																
1	Certificate	1	1	1	1																													
	Circular																																	
7	Clipping	1	3	1					3				1																	2-mounted				
	Decal																																	
	Drawing																																	
	Elector Ticket																																	
2	Illustration	2		1					1																									
1	Invitation	1	1	1	1																													
3	Leaflet	2																																
	Manuscript/Typescript																																	
	Map																																	
	Newspaper																																	
	Notebook																																	
	Painting																																	
8	Pamphlet	1	3	2	3	1				2	3	2	8																					
	Periodical																																	
2	Photograph																	1	1															
	Placard																																	
	Popcorn Box (Flat)																																	
94	Portrait	68	3	83	65	49	7	8	8																			2-scratch						
1	Postcard	1	1	1																														
	Poster																																	
	Press Release																																	
3	Print	3		3	2	3																												
	Receipt																																	
	Sheet Music																																	
	Stamp																																	
	Stereograph																																	
	Ticket																																	
	Other:																																	
2	Calendar	1																																
1	Program																																	
1	Photocopy of Ms.																																	
129		2	84	10	95	69	61	10	13	11	9																							

Figure J.3b. Condition of Paper Collections: Group Survey Report (Example)

E. CONSERVATION TREATMENT ISSUES

As stated in Chapter 8, conservation treatments are carried out by a professional conservator. They include intervention techniques to stabilize deteriorating fabric of an object, and restoration. Stabilizing treatment of an object may be undertaken to remove foreign materials, to reverse inexpert or inappropriate repairs, to halt active deterioration, and to make the object chemically and structurally sound. The goal of conservation treatment is to preserve the historic integrity (e.g., construction and materials) of the paper object. The curator works with the conservator to identify a desirable degree of treatment.

Have a Collection Condition Survey for paper objects in the collection completed by a paper conservator to establish priorities for treatment. Refer to Chapter 3 for guidance on Collection Condition Surveys.

1. Stabilization Treatment

Before beginning any treatment, the conservator thoroughly examines the object to determine its condition and its material components. If treatment with water or other solvents is needed, the conservator tests the solubility of all applied media such as inks, paints, and adhesives. Based on all of this information, the conservator prepares a written treatment proposal for curatorial staff to review and approve. Often, a number of treatment options are equally appropriate. The curatorial staff's choice of treatment will depend on a number of factors, such as how much and what kind of use is expected for the object, the size of the budget, and the number of objects requiring treatment. An example of this level of conservation treatment is as follows:

Paper records that had been water-damaged in a flood and subsequently freeze-dried were stuck together. The conservator examined them and found that the pages were made of rag paper, and were adhered to each other at "tidelines" with a watersoluble adhesive. Tidelines are formed at the edges of a waterstain where the staining and any dissolved material are concentrated as the water dries. This phenomenon is similar to the deposition of debris on the beach at the high water mark. The adhesive, originally used in the cloth and paper report binders which housed the records, had been dissolved by the floodwater and then redeposited in the paper objects as the water dried.

The proposed treatment stated that there was a risk: removing the adhesive would probably remove at least some of the pencil directly under it. However, the proposed treatment was approved. The curator advised the conservator that the records were part of a collection in which the historic sequence of the sheets and documents is critical to their archival value and usefulness. To preserve the sequence as found, the conservator kept each document segregated, and paginated the sheets if their order was not obvious from the content or if the historic sequence was out-of-order.

The conservator used steam to reverse the adhesion of the pages, and removed the residual adhesive with cotton swabs and moisture. The pencil was less dark in the areas which had been water-damaged than in the undamaged portion of each sheet, but was still legible. After separating the pages, the conservator humidified them to relax the distortions caused by the water damage and the steaming procedure. The pages were interleaved with a nonwoven polyester web to prevent them from sticking together and dried under weight between blotters to remove excess moisture and leave them flat enough for refoldering. The records were refoldered in acid-free folders. The unlabelled cloth and paper report binders were badly distorted, and according to the curator did not warrant conservation. These were stabilized by rehousing in an acid-free box.

2. Restoration Treatment

As stated in Chapter 8, the intention of restoration is to return an object to its original appearance. To be acceptable from a conservation point of view, restoration must not compromise the historic integrity of the object. An example of restoration treatment is as follows:

Through its long history, an architectural drawing had become soiled and torn. Conservation treatment procedures were used to reduce the dirt and staining, to flatten the paper, and to mend the tears. At this point, the original materials have been stabilized. However, the drawing is not safe to handle because it is not structurally sound. The lost areas of paper along the drawing's edges make it very vulnerable to tearing. These losses needed to be filled. To complete the treatment, the fills needed only to be compatible chemically and structurally with the original paper. Restoration of the drawing was performed to prepare it for an exhibit. The restoration treatment required filling the losses with paper similar to the original paper in color and texture and recreating the lost design areas.

The conservation treatment of a paper object may be complicated by the object's history of restoration treatment. Often, materials used in earlier treatments cannot be reversed without damaging the original materials. In these cases, the conservator is limited to stabilizing the object. Sometimes previous repairs can be removed, and should be removed either because they are causing damage or because they prevent the object from being used for research or exhibition. And in some cases, objects have been repaired by masterful restorers. In such cases, the restoration may itself have artifactual value as an example of historic repair techniques, and as evidence of the history of the object. When the repair materials are of archival quality and are not causing ongoing damage to the object, they need not be removed.

3. Cleaning Paper Objects

Preventing dust from accumulating is much safer for the object than removing dust once it has settled. The surface of some objects cannot be thoroughly cleaned. For example, the powdery media of charcoal drawings is easily removed along with the dust. Brittle paper objects and those with ragged edges are very difficult to clean without further damaging them.

To safely clean the surface of a paper object requires unwavering concentration, and above all, training in identifying the types of objects that can be cleaned and the methods appropriate to each. Well-meaning but untrained staff can cause extensive and irreversible damage to paper objects, even with only the most preliminary attempts to clean the objects.

Objects that have accumulated surface dirt and dust will often be grimy or otherwise damaged. Only a paper conservator should attempt to do more than remove the superficial, loosely attached surface dirt from objects in otherwise good condition.

Other conditions that require objects to be referred to a conservator for cleaning include:

- Powdery media, such as chalk, charcoal, or pastel
- Flaking media, such as varnish or tempera paint
- Extensive tears or loose parts
- Extreme brittleness or other structural fragility

If the object has no such sensitive media, is intact, and structurally sound, it may be dusted with a dry, soft brush. Instruction by trained conservation staff is advisable for this basic procedure, because paper objects are so vulnerable to mechanical damage (e.g., tearing and abrasion).

4. Alkalization Treatment

Paper objects determined to be in an acidic condition can be neutralized or alkaline buffered to extend their life expectancy. "Deacidification" is a general term that has for some time been applied to such treatments. However, to be more precise, one or more of several treatment options can be selected by a conservator, depending upon the nature of the paper object and the desired result:

Washing - an aqueous treatment performed to remove acidic elements in the paper;

Neutralization - a treatment performed to bring the pH of the paper into the neutral range.

Buffering or Alkalization - an aqueous or non-aqueous procedure by which sufficient alkaline salts are deposited in the paper to protect against the build up of acidity.

Certain pigments, dyes, and inks may fade or change in color when an alkaline treatment is applied. Some types of paper also may darken. An alkalization treatment must only be performed by a paper conservator or a person who has been specifically trained in this treatment process and works under the supervision of a paper conservator.

F. EMERGENCY PROCEDURES FOR PAPER OBJECTS

A major threat to paper collections in most emergencies is water (e.g., storm, flood, pipe leak). The steps outlined below are those to be taken by site personnel immediately after the emergency. Refer to Chapter 10 for guidance on emergency planning and to Chapter 8 for general guidance on appropriate response to emergency situations involving museum objects and for the reduction or prevention of water damage.

If only a few objects are affected and the services of a conservator can be obtained within 24 hours, keep these damp objects in a cool and secure environment. If large numbers of objects are involved and the assistance of a conservator will be delayed, arrange to have water-damaged materials blast frozen to -28.9°C (-20°F). This service can be sought from a cold storage plant, food locker, or local supermarket; (supermarkets may not have such a low temperature). It is essential that parks with large paper collections incorporate detailed arrangements for this contingency in their Emergency Operation Plans (e.g., including phone numbers of all concerned parties, approved agreement with a company to perform this service that can be activated by a phone call, arrangements for transportation of the collection to the facility, and a ready source for materials needed to prepare the collection for freezing).

Preparation of Objects for Blast Freezing

1. Wrap papers (e.g., files, flat documents) in wax paper in small bundles no more than 12" to 15" thick. At a later time, this technique will expedite the drying process.
2. Separate the bundles of flat documents or books with wax paper to keep them from sticking together.
3. Arrange paper objects in plastic milk crates.
4. Keep books with spines in a vertical position.
5. Do not unframe prints or documents, except on the specific instructions of a conservator. A print or document may be frozen in its frame. Interleave each frame in a bundle with wax paper.

It is essential that all staff designated to be involved in this process receive hards-on training/experience with this process.

Once the damaged material is frozen, there is time to decide, in cooperation with a conservator, on a suitable method for drying. Arrangements can be made for valuable materials to be vacuum freeze dried. In this process, the moisture goes from a solid to a vapor state without passing through the liquid state, eliminating further water damage.

In the less expensive vacuum drying process, much of the water does return to a liquid state before drying.

G. GLOSSARY OF TERMS USED TO DESCRIBE CONDITION

- Abrasion: surface loss caused by friction
- Accretion: deposit of extraneous material on the surface of the object
- Bloom: superficial surface cloudiness, white or blue-white, caused by moisture penetrating a surface coating, such as varnish, emulsion, or gum arabic
- Blister: separation between layers appearing as an enclosed, raised area
- Brittleness (also called embrittlement): loss of flexibility causing paper to break or disintegrate when bent
- Chalking: loss of a paint or emulsion layer by powdering off
- Cockling: buckling or waving of the paper caused by expansion and contraction under changing atmospheric conditions
- Crack: visible break in the surface, occurring when paper is creased or embossed
- Crease (also called fold): line or mark made by, or as if by, folding
- Dent, Dig, Gouge: defect in the surface, caused by a blow; a dent is a simple concavity, a dig implies that some material has been displaced, and a gouge, that material has been scooped out
- Deterioration: breakdown of the paper caused by ingredients added during the manufacturing process or by natural aging; can yield volatile acid products
- Discoloration: changes in color, such as darkening or fading
- Dog-ear: term commonly used to describe a diagonal crease across the corner of a page
- Fading: discoloration seen as loss of color and sometimes with a change of hue
- Flaking (also called flaked loss): lifting and sometimes loss of flat areas of the surface layer
- Foxing: brown or reddish-brown spots probably caused by mold or the oxidation of iron particles in the paper support, mount, or backing
- Insect damage: damage caused by insect invasion, such as holes, surface loss, or organic residue
- Loss: missing area or hole

- Mildew: group of small fungi that grow under warm, moist conditions on organic substances causing the breakdown of those substances; sometimes apparent as foxing; detectable only by a characteristic musty odor in early stages; appear as weblike outgrowths on the surface in the most advanced stages
- Mount: paper or other heavy board to which certain works on paper are attached for the purpose of extra support
- Soil: dirty material either loosely distributed on the surface of an object (dust) or firmly ingrained in the surface (grime)
- Support: the paper itself on which a design is executed
- Tear: linear break in the paper resulting from tension or torsion

H. CURATORIAL CARE CHECKLIST FOR PAPER OBJECTS

This checklist is designed to summarize the preservation approach to caring for paper objects in the museum collection.

1. Is the environment under control: relative humidity, temperature, light, and air quality?
2. Is an Integrated Pest Management Program implemented?
3. Is the environmental monitoring and control equipment functioning properly?
4. Does the park curatorial staff have a good working relationship with the park maintenance staff?
5. Are housekeeping practices appropriate and adequate?
6. Is each object housed in the most appropriate format?
7. Is each object housed in the appropriate materials?
8. Are objects segregated by the size of the enclosure?
9. Do the housing enclosures adequately support the objects?
10. Does the museum storage equipment adequately support the housing enclosures?
11. Are handling procedures adequate to protect the objects?
12. Are objects being exhibited under appropriate conditions: in safe housings and in a controlled environment?
13. Is it appropriate to consult a paper conservator (e.g., for a site survey, for a Collection Condition Survey, for conservation treatment)?
14. Does the park's Emergency Management Plan include detailed actions to be taken in the event of an emergency situation, including the potential need to blast freeze water-damaged objects?

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1030 Innes
Ottawa, Canada
K1A 0C8
(613) 998-3721

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J. ENDNOTES

1. Based on the form included in the "Jefferson National Expansion Memorial Archives Master Plan" (March 1988) written by Harry G. Heiss, Archivist, Jefferson National Expansion Memorial NHS.

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APPENDIX K: CURATORIAL CARE OF TEXTILES

A. Overview

1. What information will I find in this appendix?

This appendix discusses the physical characteristics of textiles and outlines guidelines for their long-term care and preservation. Many different kinds of objects are called textiles. They include:

- quilts and bed covers
- clothing
- tapestries and wall hangings
- rugs
- baskets and mats
- upholstery
- embroidered samplers and other household decorations

The main topics covered in this appendix are:

- textile materials, added materials, and their manufacture
- agents of deterioration
- handling, storage, display, and transportation of textiles
- working with a conservator when treatment is needed
- specific emergency procedures for textiles

2. Why is it important to practice preventive conservation with textiles?

The role of preventive conservation is to avoid, block, or minimize the **agents of deterioration**. This practice will decrease the need for costly and time-consuming conservation treatments.

Textile objects are among the most sensitive in museum collections. They are affected by light, require controlled relative humidity and temperature, and are susceptible to damage from dirt, mold, insects, pollutants and abrasion. A textile's rate of deterioration slows significantly with proper preventive care. Practicing preventive conservation also reduces the likelihood of accidents.

3. How do I learn about preventive conservation?

Read about the agents of deterioration that affect textiles so that you can create a preventive conservation plan. These agents are discussed in detail in Section D. Understanding how to protect your textiles from the agents of deterioration will lengthen the life of your textiles. See Chapter 3: Preservation: Getting Started, and Chapter 4: Museum Collections Environment, for a discussion on the agents of deterioration. Also refer to

4. Where can I find the latest information on care of these types of materials?

There are a variety of sources for up-to-date information about textiles:

- Read the NPS *Conserve O Gram* series.
 - Review the references in the bibliography. Especially note practical information found in *CCI Notes*, Section 13, Textiles and Fibres.
 - Look up the World Wide Web sources that are listed at the end of this appendix.
 - Consult a textile conservator.
 - Consult a curator or collections manager of a large textile collection.
-

B. The Nature of Textiles

The history of textiles goes back to the Stone Age. Long plant fibers were intertwined and made into baskets and mats. Basket making formed the basis of weaving technology. *Spinning*—twisting short fibers together to make a long thread—made it possible to use wool, cotton, and silk to make textiles.

Textiles are combinations of fibers, dyes, and finishes. Some textiles are decorated with thread (*embroidery*) and non-textile materials like shell, bone, and metal. It isn't possible to discuss all of these materials in this appendix. Consult the bibliography and list of resources at the end of this appendix for more detailed information

1. What fibers are used to make textiles?

Before the 20th century, natural fibers were used to make textiles. These fibers come from two main sources:

- animal fibers
 - hair
 - wool
 - silk
- plant fibers
 - stems
 - leaves
 - seeds

Twentieth century textiles may include synthetic fibers. These include fibers made from natural materials, mainly cellulose or proteins, and include:

- rayon

- cellulose acetate
- triacetate
- natural rubber

Other polymers are created in the laboratory. These include:

- nylon
- polyester
- polyurethanes

Some textiles include metal threads or yarns that are metal and fiber combinations. These can include any combination of metals and alloys, and backings or support materials.

2. *What are the characteristics of animal fibers?*

Animal fibers are made of chain-like molecules of proteins. The basic properties of the fibers are determined by the arrangement of these proteins. The arrangement of the proteins in wool explains why wool stretches and silk is more rigid.

Hairs are usually long and coarse and come from the outer coat of an animal. They are not always woven into fabric. Two examples of their use are:

- padding in furniture and clothing (horse hair)
- felt (made of rabbit hair rather than wool)

Examples of hair fibers that can be spun into yarn that is knitted or woven are:

- cashmere (goat hair)
- angora (rabbit hair or goat hair)
- mohair (rabbit hair)

Wool is the undercoat of sheep. Four factors determine the quality of wool yarn:

- the breed of animal
- the health of the animal
- the shearing process
- the cleaning process

Wool fibers have a “crimp” that lets the fibers cling together and makes them easy to spin. The elasticity and crimp of wool fibers varies by the breed of the sheep.

Silk is the long, continuous filament that comes from the cocoon of silkworms. The molecular structure is rigid. Therefore, silk does not stretch easily. Silk is sometimes treated with finishes and materials that add body and weight to the fabric. The effects of these materials are discussed in Section C.2 of this appendix.

3. *What are the characteristics of plant fibers?*

Plant fibers are composed mainly of cellulose molecules. The basic properties of the plant fibers are determined by the rigid structure of fairly regular chemical groups that attract water. The presence of water makes the fibers flexible and resistant to breaking.

Fibers can come from the stem, leaf, or seeds of plants. After harvesting, the fibers are separated, cleaned, and processed for spinning into thread. Each of these processes has an impact on the quality of the thread, and can influence the long-term preservation of a textile.

Flax is the most common stem (bast) fiber. Flax fibers are spun to make **linen** thread. Flax is soaked in water to loosen the fibers from the inner bark of the plant. This process, called *retting*, causes the fibers to decompose slightly. Further mechanical processing is needed to release the fibers from the bark. These fibers are hard, and not elastic. In processing, linen is:

- strong when wet
- resistant to heat
- difficult to bleach
- difficult to dye to concentrated colors

Leaf fibers are hard and strong. They are good materials for rope, cords, sandals, and baskets. Some examples that may be in collections are:

- sisal
- raffia
- abaca
- hennequin
- yucca

Cotton is the most common seed fiber. Cotton is nearly pure cellulose, and the fiber is relatively rigid. *Mercerization*, a common processing technique introduced in 1844 makes dyeing easier. It also adds softness and flexibility to cotton fabric. Other seed fibers are:

- coir (coconut fiber)

- kapok

4. *What are the characteristics of synthetic fibers?*

Synthetic fibers have been designed to have a variety of performance characteristics. For example, polyester is very strong and resists wrinkling. You should not assume that synthetic fibers are sturdier than older fibers, or even contemporary textiles made of natural fibers. Synthetic fabrics have only been available in large quantities since the 1930s. We already know that some of these fabrics do not age well. Others have not been studied long enough to know the long-term effects of aging. Monitoring the condition of 20th century textiles in collections will help conservators develop a picture of long-term changes in characteristics and preservation concerns for synthetic fibers.

5. *What are the characteristics of metal threads?*

Metallic threads can be woven into the structure of a fabric or used for embellishment. The metals are subject to oxidation (see Appendix O: Curatorial Care of Metal Objects). Metallic threads are produced in various forms including:

- gold metal layer on silver strip
- gold, silver, and other metals and alloys cut into thin strips
- small diameter metal wires of gold, silver, and copper alloys
- thin strips of metal wound around a core of thread (usually silk or linen)
- thin sheets of metal applied to leather or paper
- metallic powders and pigments applied to Mylar® or other synthetic backings

C. The Fabrication of Textiles

1. *What techniques are used to make textiles?*

There are many techniques that result in cloth or cloth-like materials. Fabrication also includes the addition of color (dyes), finishes, and other decorations. It is the structure that is important in determining the characteristics of the cloth and is directly related to its ultimate use.

Some of the techniques used to make textiles are included here:

Felting is the process of using heat, water, and pressure to interlock loose fibers together. The best raw material is sheep wool because of its chemical structure and crimp. Lacquers and sizings can be used to stiffen the felt for particular uses. The same basic techniques for making wool felt are used today with synthetic fibers to produce synthetic felt.

Spinning is the process that converts short fibers into long threads or yarns. Loose fibers are pulled from a mass of prepared animal or plant fibers and twisted to create the yarn. This can be done by rolling the fibers down the spinner's thigh, by using a spindle, or by using a spinning wheel.

Netting is produced from a single, continuous strand using a tool called a shuttle. The thread is looped and may be knotted. Netting is the basis of

some lacemaking and tatting. Knitting and crocheting are other looped structures.

Lacemaking refers to a variety of techniques that involve the intricate twisting of fine threads to form a pattern. These include needlelace and bobbin lace that use combinations of twisted, crossed, plaited, and knotted structures.

Macramé is a knotting technique that uses more than one strand of yarn. This technique is used primarily for fringes and edgings.

Weaving is the making of cloth by interlacing threads of the warp and weft on a loom.

- *Warp* is the parallel yarn stretched on a loom (lengthwise).
- *Weft* is the transverse yarn interlacing with the warp in a pattern.



Figure K.1. Upright loom. (Weavers Mae and Sadie Curtis of Ganado at Hubbel Trading Post. Photograph by Fred Mang Jr. HUTR-23347)

Many structures and variations have been developed to produce fabric. The simplest structure of weaving (*plain weave*) is over-one, under-one interlacing of perpendicular warp and weft elements. The structure determines the characteristics of the fabric. Detailed discussions of weaving can be found in references listed in Section Q of this appendix.

2. *What kinds of finishes are used on textiles?*

Few textiles are simply processed fibers made into cloth. Dyes, lubricants, chemical compounds, mechanical treatments, sizing, water and stain repellents, mothproofing, and flameproofing are some of the treatments that prepare fabrics for use.

- *Dyes* are plant materials and various chemicals that add color to textiles. There are two general categories of dyes:

- natural (from plants, some insects, and some mollusks)
- synthetic (chemically produced colors developed in the 19th century)

Many natural dyes have good wash and light fastness. Early synthetic dyes are known for their harsh, bright colors, and poor wash and light fastness.

Some dyes have an affinity for textile fibers, but most require assistance to attach to the fibers. These chemicals, called *mordants*, are usually metallic salts applied to the cloth before dyeing begins. Mordants also can modify the dye color (different mordants used with the same dye material produce different colors).

Natural dyes mordanted with iron produce a black or brown-black color. These dyes deteriorate and destroy the fiber. Many printed cottons and tapestries used iron-mordanted yarns to outline designs. Often there are holes left in the fabric where these yarns used to be.

- *Cropping, napping, and shearing* of cloth raise the fibers to produce a soft, slightly piled fabric. *Rubbing, pressing, and glazing* give a smooth, lustrous surface. These mechanical processes are sometimes combined with oils, gums, starches, beeswax, varnishes, pitch, and gelatin. Egg white and water, or gum arabic was used on glazed woolens and linsey-woolsey blends in the 18th century. These finishes are fragile and can be damaged by handling and moisture.
- During weaving, oils, lubricants, and sizing are often used to keep yarns from tangling and to strengthen the warp against the friction of the loom. These materials are usually washed out by a laundry method called *scouring*. Scouring can range from gentle cleaning to processes using heat, pressure, and agitation.
- *Fulling* involves the use of lubricants, detergents, and other additives with water, heat, and agitation to produce felt. Felting causes the fibers to shrink and adds softness, body, and strength to the fabric. Very thorough felting produces strong, nearly waterproof fabrics that have been used for tents, coats, and shoes.
- Cotton threads and fabrics can be treated with a strongly alkaline chemical to add strength, durability, and luster to the fiber. This process of *mercerization* also reduces shrinking and makes the fiber more receptive to dying.
- During the 18th and 19th centuries, silk fabrics were sometimes treated with a variety of metallic salts to produce fuller, heavier textiles. These *weighted fabrics* were used for clothing, flags and banners, fringes, and tassels. When they were new, these fabrics had a fuller feel and drape than pure silk. However, weighted fabrics are not strong, and when aged, fracture and powder very easily. Washing and dry-cleaning easily damage weighted silks. They are very sensitive to the effects of light, moisture, and air pollution.

Finishing processes for synthetic and newer fabrics include:

- synthetic resins
- plasticizers
- mothproofing agents
- flame proofing chemicals
- emulsions used for soil, crease, and water repellency

Some of these processes are chemically active and their degradation products destructive to the textiles. Others are so recent that their long-term effects are not known.

Finishes are responsible for the performance and many of the characteristics of textiles. However, some of these treatments and chemicals enhance deterioration and limit the possibilities of conservation treatments.

3. *What other kinds of decorations are used on textiles?*

In addition to dyes, the texture of different weaving structures, and the effects of cutting and piecing fabrics together, textiles can be decorated with *embellishments* including:

- paint, pigments, and gilt
- braids and fringes
- added stitches
- metals
- beads
- fur and feathers

Embellishments may or may not be a structural component of the textile. Some embellishments, like beads, may be quite heavy. The areas where they are attached may be weak, and require extra support and care in handling.

- **Paint, pigment, and gilt** can be added to textiles to create surface designs. Printers' gums, waxes, starch, and adhesives may be present as well. These materials often are soluble in water. They also tend to stiffen the textile. Paints and gilt can crack when the textile is flexed or folded. Special care is needed for display, handling, and storage of painted textiles.
- **Fringes** may be a part of the structure of a textile or added after manufacture. In historic houses, fringes on rugs and carpets are subject to damage if they are in a public pathway.

- **Added stitches or embroidery** is a common form of decoration. All types of thread and yarn are used for embroidery. Embroidered textiles are most vulnerable to damage where the yarn or thread is stitched through the ground fabric. Cutting or tearing of the fabric is a result of the stress from tension on the yarn, or the interaction of the ground fabric and the thread together. For example, metallic thread is heavy and sometimes has sharp edges. It can cut or tear the textile.
- **Metals** in the form of metallic threads, metal strips, braids, and wires are used to decorate textiles. These decorations are often heavy and place strain on the underlying textile. A variety of metal combinations (alloys) have been used on textiles. The preservation concerns for these materials vary with the type of alloy (see Appendix O: Curatorial Care of Metal Objects).
- **Beads, buttons, and sequins** also can be used for decoration on textiles. These can be made of a wide variety of materials including glass, bone, stone, plastic, ceramic, and wood. All of these materials have different rates of deterioration and interaction with the textile. For example, early sequins were made of gelatin. In situations of high humidity these sequins become sticky and can dissolve.
- **Fur and feather** trims are particularly vulnerable to pest infestations and need to be monitored carefully.

D. Deterioration of Textiles

1. What agents of deterioration affect textiles?

Many factors contribute to a textile's deterioration. These *agents of deterioration* can occur naturally, or they can result from external forces. Avoiding agents of deterioration is the key role of *preventive conservation*. The agents that affect textile collections most are:

- light (visible and ultraviolet)
- temperature
- humidity
- pollution
- pests

Knowing the ideal settings for temperature, relative humidity, and visible light, and knowing how to filter UV radiation and pollution is essential for preserving your collection. An Integrated Pest Management (IPM) Program is essential to protect your collection from pests. For more information about these agents of deterioration, see Chapter 3: Preservation: Getting Started.

2. How do textiles change over time?

As all materials age, they slowly break down and constantly deteriorate. The basic deterioration of textiles is the gradual breaking down of long-chain fiber molecules into shorter chains. The result is brittleness. Other forms of natural deterioration are:

- *gradual loss of inherent moisture*: Natural fibers come from living sources with biological functions. As they age and the structure of the fiber changes, fibers become less elastic and resilient.
- *effects of impurities*: The presence of small amounts of metals, such as copper, can accelerate deterioration in the presence of bleaching agents, ozone, ultraviolet radiation, and moisture.
- *impact of manufacturing*: Iron mordants, oils and lubricants used to facilitate the weaving process, and bleaching are some of the manufacturing processes that can contribute to the deterioration of textiles.
- *inherent vice*: Sometimes methods of manufacture and the nature of materials cause deterioration that cannot be controlled and may not be treatable. The most striking example of inherent vice is the impact of the addition of certain metallic compounds to silks to add weight and drape to silk fabrics. These compounds bond to the silk fiber and cause their eventual splitting and powdering. Another example is the interaction of some metal threads and decorations with textiles. The natural deterioration of wool accelerates deterioration of silver metallic threads causing tarnish. The tarnish can then stain the wool.
- *oxidation*: Fabrics are naturally degraded by the presence of oxygen. The result is an overall brownish discoloration on white or natural-colored textiles. When treated with water, some of these oxidation products are dissolved. However, the oxidation process begins again immediately.

3. *How does the environment affect my collection?*

Temperature, relative humidity, light, and pollution directly affect the rate at which a textile ages. Storing and displaying textiles in areas where temperature is too high and RH is too high or low will increase deterioration rates and promote pest activity. Constant or large fluctuations in temperature and RH are harmful, too. Textile fibers are *hygroscopic*—they readily take up and lose moisture. Fluctuations of relative humidity and temperature cause textiles to take up or lose moisture. These fluctuations cause dimensional change and mechanical stress that can lead to breakage and structural damage of weak yarns. Natural and artificial lighting cause textile dyes to fade. UV radiation causes fading to happen quickly and fibers to become brittle. Pollution, including dirt, settles in the structure of a textile, causing its character to change completely. Pollutants also affect dyes, finishes, and many embellishments.

4. *What are the ideal temperature and RH ranges for textiles?*

Store textiles at temperatures between 65° and 75° F and relative humidity as close to 50% as possible. Low temperatures are not a problem for textiles and may help slow down the rate of deterioration for textiles that are damaged by weighting. High temperatures can embrittle textiles, and together with high relative humidity, promote biological activity. Low relative humidity (under 35%) can embrittle textiles. Avoid temperature and relative humidity fluctuations.

5. *How does light affect textiles?*

Light causes textile dyes to fade and undyed textiles to bleach or darken. Light can also be a catalyst for deterioration of weighted silks. Light damage is cumulative and irreversible. The amount of light damage

depends on the type of light (ultraviolet and/or visible), intensity of the light, and duration of exposure. Evaluating your collection's lighting conditions and making appropriate adjustments can prolong the life of your collection. Review the natural and artificial light sources in your storage and display areas. Use monitoring equipment to identify levels of UV radiation and illuminance (levels of visible light are measured in "lux").

Reduce your collection's exposure to light by storing and displaying textiles in rooms without windows. (Clear UV-absorbing films will reduce UV levels, but will not reduce illuminance.) Cover all windows with drapes or blinds to further protect textiles. Avoid storing and displaying textiles in rooms with doors that open to the outside.

The maximum illuminance recommended for textiles is 50 lux. All UV light should be filtered. Consider ways to limit the total light exposure, such as automatic dimmer switches, or simply turning out lights when visitors are not present.

6. *What kinds of pollution affect textiles?*

Outdoor pollutants, such as dust and pollen, can easily be brought into a museum through open doors and windows. Industrial emissions as well as natural processes of erosion create pollutants. Cleaning products, asbestos fibers, building materials, paint, carpeting, and other indoor materials can generate pollution from within a museum. Cigarette, cigar, and pipe smoke are also harmful forms of pollution.

Dirt disfigures, dulls, and stains textiles. Dirt and dust also contain a high proportion of silica. The sharp surfaces of silica can cut and abrade textile fibers, especially when the fibers expand and contract in response to changes in RH.

Sulfur dioxide bleaches, discolors, and embrittles textiles. Hydrogen sulfide in the presence of moisture darkens lead pigments, tarnishes metals, and reacts with finishes and some embellishments.

Formaldehyde in paints, varnishes, wood products, and carpeting damage some dyes.

Tar and particulates from tobacco products stain textiles and are difficult to remove.

7. *How can I control pollution in my storage or display area?*

Follow these practices:

- Keep doors, windows, and outside vents closed whenever possible.
- Never allow smoking or fireplace fires in the building.
- Choose new building materials, paints, and carpeting that do not emit harmful gasses.
- Don't use custodial cleaners that emit harmful gasses (for example ammonia).
- Use appropriate particulate and gaseous pollution filters in your HVAC system.

- Store textiles in closed cabinets with appropriate gaskets.
- Keep particularly vulnerable objects in sealed display cases. Make sure these cases meet the recommendations in *MH-III*, Chapter 7: Using Museum Collections in Exhibits, and NPS *Exhibit Conservation Guidelines*.

For more information on controlling pollutants, see Chapter 4: Museum Collections Environment.

8. *What pests are attracted to textiles?*

Textile fibers are an excellent source of food for microbes and insects. Sizing, starch, gelatin, binding media for pigments, soils, and stains also are attractive to pests.

- Case bearer and webbing clothes moths are attracted to high protein material including wool, silk, hair, fur, feathers, and skins. The female moth lays eggs within the weave structure of the textile. The eggs hatch and the larvae feed on the textile material. Larvae take on the color of the materials they consume, making them difficult to see. Moths channel through the textile making holes, or “graze” on the surface thinning the yarns and weakening the textile structure.
- Silverfish, cockroaches, termites, and woodworms eat cellulose and graze on parchment, leather, paper, fabrics, glues, and painted decorations.
- Woodworms, termites, and carpet beetles can be found in furniture and associated furnishing fabrics, upholstery, and the inner structure of upholstery materials. Carpet beetles also attack silk and wool textiles.
- Mold and mildew grow in warm, damp locations. Irreversible brown stains are caused by enzyme attacks from the digestive processes of these organisms.

9. *How can I protect textile collections from pests?*

Follow these practices:

- Develop and implement a regular housekeeping plan. Pests are attracted to soils and a dirty environment.
- Develop and implement an IPM plan. Regular inspection and recording sightings of insects or insect debris is crucial to any pest management system. All park staff can be integral to systematic preventive conservation through identification of problem objects or areas.
- Prevent the initial entrance of insects into the collections. Flowers, plants, and potting soil are good sources for introducing an insect problem to the site. These materials should not be permitted in buildings that house collections.
- Isolate newly acquired collection objects from the rest of the collection. Determine if any insects are present and make sure they have been eradicated before new collections are integrated into storage or exhibition areas.

- If an infestation is suspected or located, isolate affected objects from the rest of the collection. Examine the surrounding area to locate possible sources of infestation (such as beneath floorboards, inside a cushion, or in bird and rodent nests under eaves and between walls).
- Immediately consult with a conservator and your park or regional IPM coordinator to identify appropriate treatments.

For more information about IPM and pest infestations, see Chapter 5: Biological Infestations

Controlling pests and the environment—light, temperature, relative humidity and air pollution—are keys to the long-term preservation of textiles.

E. Proper Handling of Textiles

1. What do I need to consider before handling a textile?

Following are a few guidelines:

- Keep hands away from textiles unless handling is absolutely necessary. The body gives off acids and oils through its pores that can damage textiles. Wash hands often and use white cotton gloves whenever possible.
- If the textile is fragile, carry it flat on a support.
- Make sure there is a clean surface of adequate size available before you move a textile from one place to another.
- Avoid carrying all but the smallest textiles by yourself. Get another person to help when you are transporting large, heavy textiles. Use a well-padded cart in good condition to transport boxed and smaller items.
- Remove jewelry, badges, belt buckles, and watches that might catch on and tear textiles, especially during installation and preparation of textiles for storage.
- Use clean, padded surfaces when working with textile collections. Keep tools, inks, and other writing materials away from the work area. Use only pencil when working around textiles.
- Avoid placing textiles one on top of another. When stacking them is absolutely necessary, interleave textiles with unbuffered, acid-free tissue paper, and be aware of the weight of one textile on another.

2. How should I handle textile objects?

Unlike a ceramic or wooden sculpture, textiles are not rigid, and need to be supported when they are lifted. Lack of support can result in stretching and tearing of the fabric.

- Roll a flat textile around an archival tube for transport or storage.

- Textiles with fragile surfaces, beads, heavy embroidery, or other surface attachments can be fan-folded and supported on a muslin-covered, corrugated archival board or in an archival cardboard tray (see Figure K.2).
- Place a muslin-covered, corrugated archival board or archival cardboard tray under fragile textiles and fragments for support.
- Large, heavy textiles (such as carpets and tapestries) require two handlers even if rolled on a support tube.
- Pad the interior of costumes with crumpled unbuffered, acid-free tissue and transport them in archival textile boxes.
- Fold pieces as little as possible. Textiles tend to break along fold-lines in time. Pad folds with crumpled unbuffered, acid-free tissue paper.
- Transport supported textiles on a well-padded cart.

Always use a support or container when moving textiles.



Figure K.2. Fan folding a textile into archival tray

F. Storage Specifications

1. What do I need to know about storing textiles?

Improper storing of textiles can be a catalyst for deterioration. Consider the elements that affect a textile in storage.

- Control the agents of deterioration.
- Choose appropriate storage space and equipment. Use only archival materials (tubes, unbuffered tissue, cardboard) in contact with textile objects (see Chapter 7: Museum Collections Storage).

- Ensure that proper security and fire detection and suppression equipment is installed and maintained (see Chapter 9: Security and Fire Protection).

2. Where should I store my textiles?

Your collection size is an important consideration when you determine where to store your textiles. If you have many textiles, consider creating a dedicated storage room. If you have only a few textiles in your collection, dedicate a space or cabinet in your museum storage area for your textiles. As much as possible, store textiles in properly gasketed closed cabinetry. Closed cabinets provide extra protection from pests, as well as potential water damage that might result from a flood or fire. Never store textiles:

- in attics or basements
- against exterior walls
- near furnaces or heating/air conditioning vents
- in spaces below water pipes

3. How should I store my textiles?

The structure of a textile, its condition, and size determine the best storage method. In general, you will choose from the following storage methods:

- archival rolling tubes
- flat-file cabinets
- archival boxes
- costume wardrobe cabinets
- shelving units
- specialized containers

G. Storing Flat Textiles

1. Which textiles are stored flat?

Flat storage is ideal for most textiles because it provides complete support for the object. Small textiles (for example, samplers and some household linens), fragments, and particularly fragile textiles should be stored flat. Flat storage is impractical for most large items like carpets and tapestries. However, permanently gathered or pleated curtains should be stored flat in archival costume boxes or drawers using padding techniques described for costume (see H.5 below).

Shallow drawers, like flat file cabinets, are well suited to flat textile storage. Sturdy textiles can be stored between sheets of unbuffered archival tissue. Avoid stacking textiles as much as possible. More delicate textiles may require a support to protect the fabric as it is lifted from the drawer. A simple support can be constructed by covering a piece of corrugated archival cardboard with washed muslin. Line drawers with closed cell polyethylene foam such as Volara®.

Very fragile small textiles (for example, brittle archeological textiles) may require additional protection. A modified print mat provides space economy as well as protection for handling and storage. (see *MH-1*, Appendix I, Figure I.8 Construction of a Portfolio Mount for Archeological Textile Fragments or *Conserve O Gram* 16/3 “A Simple Storage Mat for Textile Fragments”).

Other textiles that are best stored flat include:

- velvets, and other textiles with a pile structure that could be crushed if rolled or folded
- textiles with a fragile surface, such as gilt or paint
- textiles that are particularly brittle or stiff
- textiles with a very uneven surface, such as strongly raised embroidery
- textiles with heavy beading or metallic embroidery
- costumes cut on the bias

2. *Which textiles are rolled for storage?*

Flat textiles (for example, Navajo rugs, tablecloths, and tapestries) are usually rolled for storage because they are too large to handle safely if stored flat. Archival rolling tubes are available in 2" and 3" diameters. Choose a tube with a diameter suitable for the object being stored. The 2" diameter tube is ideal for thin textiles, for example, a length of lace. The larger diameter tube is suitable for carpets or coverlets. The outside of a tube can be covered with bubble wrap to create an even larger diameter tube for oversized, fragile textiles. The tube should be at least 6" longer than the width of the textile.

3. *How do I roll a textile for storage?*

Work on a clean, well-padded surface (mattress pads make good covers for worktables). Lay the textile flat, gently smoothing wrinkles. Most textiles should be rolled face in so that the design will be face up when the textile is unrolled. Textiles with raised surfaces should be rolled face out. If the textile has a lining, roll lining side in. When a double thickness of fabric is rolled, the inner layer tends to wrinkle. It is preferable to create wrinkles on the lining rather than on the face of the textile.

- Roll unbuffered archival tissue once around the tube to provide a “leader” to guide the textile onto the tube (see Figure K.3). The tissue should extend slightly beyond the width of the textile but not beyond the edge of the tube.
- Interleave unbuffered archival tissue as you roll to protect the face of the textile.
- Two or more people should roll large pieces to maintain a uniform tension.
- To protect the roll from dust, cover it with washed muslin tied in place with cotton twill tape. Attach catalog and other identifying numbers to the dust cover to prevent unnecessary unrolling.

- Long or uneven fringes are difficult to roll. Make a “fringe folder” from a piece of unbuffered archival tissue to enclose fringes and simplify the rolling process.

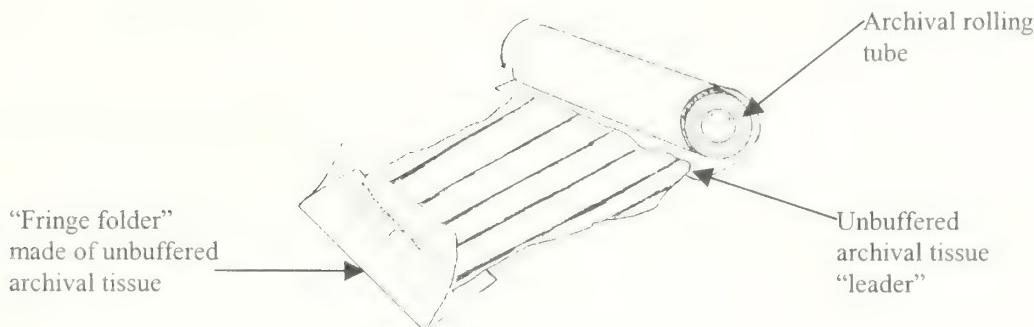


Figure K.3. Technique for rolling flat textiles for storage

4. *Is it safe to roll quilts and counterpanes for storage?*

Quilts and counterpanes are usually three layers thick (face, padding, lining). If the fabrics are in stable condition and there is no weakness in the stitching, they can be safely rolled. As with lined textiles, roll quilts and counterpanes **face out** with the lining or backing side in.

Many Victorian “crazy quilts” are made of weighted silk and velvet fabrics. These fabrics split and become powdery as they deteriorate. They should **not** be rolled for storage. Fragile over-sized textiles, like crazy quilts, can be fan-folded on a support board and stored in a drawer. Alternatively, these textiles can be stored, with minimal folding, in an archival costume box using the same general techniques described in H.5 below.

H. Storing Costume Collections

1. *How do I store dimensional textiles such as costume?*

Costume objects are stored in one of two ways depending on condition:

- hanging in a wardrobe cabinet
- folded in an archival textile or costume box

2. *How do I know which method of storage is best for costume?*

In general, fitted, constructed garments in good condition can be hung for storage (for example, dresses, bodices, coats, and jackets coming from the European clothing tradition). Museum storage hardware companies manufacture both costume wardrobe cabinets and clothing racks for this purpose. This type of storage is the most economical for costume storage because it takes less space than flat storage.

Ask the following questions to evaluate the best form of storage for costume items:

- Are shoulder seams strong and intact?
- Is the fabric in the hanging area free of splits, holes, or other weakness?
- Can the waistline support itself without causing strain at the shoulders or waist?
- If the waistline can't support itself, can it be adequately supported with the addition of waist tapes? (See Question 3 and Figure K.4)

If the answer to all of these questions is “yes,” proceed to prepare the costume for hanging storage. If “no,” store the costume flat following the instructions in Question 5 below.

Unconstructed clothing is better stored flat, or with minimal folding, in an archival box (for example, kimonos, and many forms of ethnic dress that use the rectangular shape of fabric yardage in clothing construction). The following are also best stored flat in boxes or drawers:

- fragile costumes and garments with weakness at the shoulders
- men’s breeches or pants
- dresses with fragile waistlines
- skirts
- costumes with heavy beading
- bias cut garments (for example, some couture costume and “flapper” dresses from the early 20th century)

3. How do I properly support and protect a garment for hanging storage?

The goal of good hanging storage is to provide sufficient support to reduce strain across the shoulders and other vulnerable areas (for example, the waistline of a dress with a heavy skirt). See *Conserve O Gram 4/5, Storage Techniques for Hanging Garments: Padded Hangers*, and *4/15, Storage Techniques for Hanging Garments: Dust Covers*.

Choose or modify a wooden hanger to provide the base for a hanging support. The ends of the hanger should reach into the sleeve, just beyond the sleeve seam.

- Reduce potential strain from heavy, bulky, or awkward garments by providing waist supports.
- Use a dust cover to protect each costume from dust, light, and abrasion from contact with other garments.
- Label dust covers with catalog and other identifying numbers to avoid unnecessary handling of the garment.

- Hang costumes in closed, properly gasketed cabinets, leaving at least 1.5 inches of space between each object. If costumes must be stored on open racks, always use **closed** dust covers.

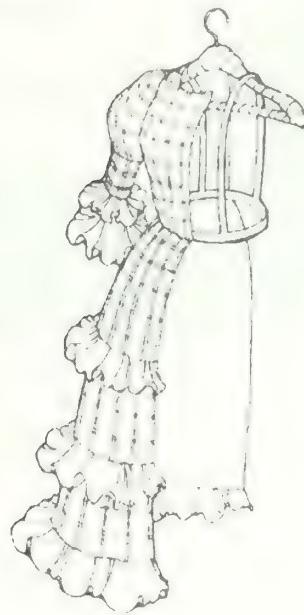


Figure K.4. Twill tape waist supports (illustration by Jian Wu, reproduced with permission of Abrams Publishers)

4. *Why should I use dust covers for hanging costume?*

Dust covers do more than protect a garment from dust and light. For example dust covers:

- protect the textiles from oils and acids from your hands
- prevent the transfer of fugitive dyes from one object to another
- prevent metallic embroidery and other attachments (for example braid and buttons on military uniforms) from catching on and tearing other garments
- prevent abrasion of adjacent objects as costume items are moved in and out of storage cabinets

5. *How do I prepare an unconstructed garment for storage?*

Unconstructed garments (such as Pueblo and Hopi kilts and dresses) are stored flat in archival boxes or in drawers. The goal of good flat storage for these garments is to:

- use as few folds as possible
- provide adequate padding in folds to prevent creasing
- provide adequate support to safely lift the garment from the box or drawer

A muslin "sling" is useful to lift a garment from a box (see Figure K.5). A muslin-covered corrugated board, with or without a muslin wrapper, is useful to lift a garment from a drawer.



Figure K.5. Muslin “sling.” Muslin can be placed under and folded over a garment to be used as a “sling” to lift and move the item. The “sling” also acts as a dust cover to protect the textile from handling.

To prepare an unconstructed garment for storage using a support board

- Lay the garment flat on a clean, padded surface.
- Cut corrugated board slightly larger than the size of the folded garment and slightly smaller than the interior dimensions of the drawer.
- Cut one piece of washed and ironed muslin the same length as the support board and three times the width, and one piece the exact length and width of the support board.
- Clean-finish the edges of both muslin pieces with pinking shears or a zigzag machine stitch.
- Attach the smaller piece of muslin to the support board with four small tabs of archival double-sided tape at the corners.
- Center the larger piece of muslin below the board and secure it to the board with strips of double-sided archival tape (1/3 of the muslin will extend beyond the edge of the support board on either side).
- Lay the garment on the support board with the neck or top edge just below the edge of the board, and the other three sides hanging over the edges.
- Place padding (for example, crumpled unbuffered archival tissue or batting “sausages”) in the garment seams.
- Using as few folds as possible, placing padding in each fold, fit the garment onto the backing board.

- Drape the muslin extensions over the folded garment and tie closed with cotton twill tape.
- Label the cover with catalog or other identifying numbers to prevent unnecessary unwrapping.

To prepare storage without a support board:

- Cut one piece of muslin the same length as the storage box and three times its width.
- Center the garment on the muslin and fold as above, making sure to keep the final size of the folded garment slightly smaller than the box interior.
- Drape the muslin extensions over the folded garment and tie closed with cotton twill tape.
- Using the muslin cover for lifting, lower the folded, wrapped costume into the costume box.
- Label the cover and the outside of the box with catalog or other identifying numbers to prevent unnecessary unwrapping.

Use two people to transport costumes on support boards and to lift costumes from drawers and storage boxes.



Figure K.6. Rolled or crumpled archival tissue pads the folds of the dress. To keep the garment from shifting as the box is transported, additional rolls of tissue fill the empty space in the box.

I. Storing Costume Accessories

1. What are costume accessories?

There are many objects besides clothing included in costume collections. These objects are often composed of several materials, including wood, leather, bone, ivory, metal, paper, fur, and feathers. For example, costume accessories include:

- hats and bonnets
- shoes
- gloves
- purses
- fans
- umbrellas and parasols

Costume accessories are composite objects made of several materials. The care of these objects requires attention to the specific needs of those various materials. Refer to the *Conserve O Gram* series for information on the care of individual materials. See also Appendix N: Curatorial Care of Wooden Objects, Appendix O: Curatorial Care of Metal Objects, and Appendix S: Curatorial Care of Leather and Skin Objects. You will need to provide special storage supports for most costume accessories.

2. *How do I store hats and bonnets?*

Construct padded polyethylene foam supports for hats and bonnets to maintain their shape (Figure K.7). The support should raise the brim slightly off the shelf to prevent distortion. Hats with weak brims will require a full support in the crown and under the brim. Hats with weak crowns should have a soft insert (rather than rigid polyethylene foam).

- Store hats in closed, gasketed cabinetry.
- Store hats separately from original hat boxes.
- Construct a drop-sided box to facilitate handling if a hat needs to be stored in a box for its protection (Figure K.8).
- Do not stack hats.
- Protect bows, feathers and other appendages from abrasion and crushing by padding with unbuffered archival tissue.



Figure K.7. A fabric-covered polyethylene foam support has been created to support the crown of this Civil War cap. A thin piece of Plexiglas® supports the bill.



Figure K.8. Leghorn bonnet on a support inside a drop-front archival storage box.

CAUTION: Hats made of fur, feathers, and pieces of taxidermied birds and animals may contain pesticide residues including arsenic. Test all bird and mammal skins collected and prepared prior to the mid-1980s (see *Conserve O Gram 2/3, Arsenic Health and Safety Update*). If arsenic or another pesticide is suspected, use the following handling precautions:

- Do not touch specimens with bare skin. Wear plastic gloves and a protective smock or lab coat. Wear a dust mask rated for toxic dust. If possible, handle the object or specimen by a container or a mount.
- Always wash hands after working with specimens. Discard gloves. Keep the protective smock or lab coat clean. Do not take protective clothing home to wash—especially if you live with small children or elderly people.
- Obtain a Material Safety Data Sheet (MSDS) on arsenic and other pesticides and keep in the park's curatorial workspace/office. Consult the MSDS for specific information.
- Label museum cabinets or storage spaces that house specimens contaminated with pesticides with warning signs. Also label individual specimens that have been tested. Prepare and post a written set of instructions for handling specimens contaminated with arsenic and other poisons.

Consult Chapter 11: Curatorial Health and Safety, for more information.

3. How do I store shoes?

Shoes should be padded for support on display and in storage. Supports should fill the entire shoe all the way to the back of the heel. Make a "sock" of cotton stockinet to fit the interior of the shoe. Stuff the sock with polyester batting from the toe to the arch. Insert a shaped piece of rigid polyethylene foam from the arch to the heel, and stitch the sock closed. The

sock should provide uniform, solid support without stuffing the shoe tightly.

- Support the entire shoe. Do not handle shoes by the heel alone.
- Provide adequate support to the ankle and leg sections of boots by constructing a second "sock" filled with polyester batting to fill that area. If the ankle is weak, the support can be constructed of shaped polyethylene foam.
- For the protection of staff as well as the shoes, do not store shoes and boots on upper shelves or movable shelves. It is best to contain shoes and boots within shallow boxes for storage.
- Store shoes and boots in closed, gasketed cabinetry. If this is not possible, provide dust covers of washed muslin for each pair. Label the dust cover with catalog and other identifying numbers to prevent unnecessary handling.

4. *How do I store gloves and mittens?*

Gloves and mittens may require internal supports to prevent crushing or creasing. Do not force a support into the fingers of the glove. A simple support can be cut from 2-ply archival matboard. Be sure to sand or burnish the cut edges of the board so that there are no rough spots. If more padding is required, pad the matboard with polyester fleece Pellon and finish with a layer of cotton stockinet (Figure K.9).

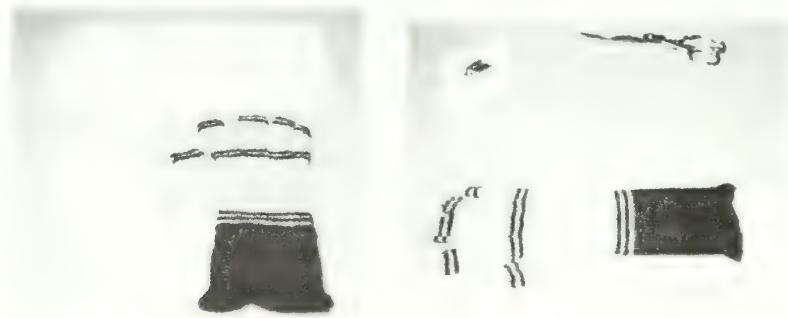


Figure K.9. Internal support for gloves and mittens. Internal supports should be smooth and slightly smaller than the object. Do not over pad the interior of a dimensional textile.

5. *How do I store bags and purses?*

Bags and purses may need to be gently stuffed with unbuffered archival tissue to maintain their shape. The best way to prevent damage to handles, chains, and clasps, is to wrap them with tissue, or create cavity packs in storage drawers. Cavity packing offers the additional benefit of isolating the metals and other materials of the handles and chains from the textile.

6. *How do I store fans?*

Fans should be stored closed if they are in good condition. Storing fans open may cause distortions that will prevent their being closed in the future. However, if the paper or fabric body of the fan is cracked or split, repeated opening and closing will cause damage. In this case, the fan should be stored open on a graded support (see Figure K.10).

- Provide support for tassels attached to the heel of the fan.
- Store fans separately from original cases or boxes.

Step 1: Cut a fan-shaped support board from 4-ply archival mat board or archival corrugated board at least 1" larger in dimension than the fan.



Step 2: Cut wedge-shaped pieces of polyester batting, layering them on the support board to match the profile of the opened fan.



Step 3: A small roll of batting will be necessary to support the uppermost fan sticks.



Step 4: Cover the padded support with washed cotton fabric, stitching the cover together in the back. Make two parallel cuts through the mount on both sides and thread twill tape ties through to the front. Secure the fan sticks with the twill tape ties.



Figure K.10. Padded support for a fragile fan.

7. *How do I store parasols and umbrellas?*

Parasols and umbrellas are composite objects made of combinations of fabric, paper, bone, wood, and ivory. The condition of individual objects will determine the best storage method.

- Check for metal corrosion and sharp edges. These will need to be wrapped or padded to prevent damage to the rest of the object.
- Store parasols and umbrellas slightly furled, padding the folds with unbuffered archival tissue that is rolled into narrow cones (Figure K.11).
- Do not open a parasol or umbrella completely unless it is absolutely necessary.
- If the parasol or umbrella fabric is relatively sturdy, wrap the padded object in muslin secured with twill-tape ties before laying it in a drawer.
- If the parasol or umbrella fabric is weighted silk or another fragile material, wrap the padded object in unbuffered archival tissue before securing it in a muslin wrapper.
- Label the muslin wrapper with catalog and other identifying numbers to prevent unnecessary handling.



Figure K.11. Pad the folds of an umbrella with cone-shaped rolls of archival tissue.

J. General Considerations for Exhibition

1. *How often should I rotate textiles in exhibitions?*

Textiles are fragile. They are subject to deterioration by improper levels of temperature and RH, UV and visible light, pests, pollutants, and improper handling. Like other sensitive materials, you should periodically change textiles in exhibitions.

Rare or fragile textiles should remain on display for periods of three to six months. Sturdy textiles, properly mounted and displayed in optimum exhibition conditions may remain on display for six to nine months.

Long-term and permanent exhibitions should be designed to allow for rotation of textile objects at three, six, or nine month intervals, depending on the condition of the item.

2. What are special considerations for exhibiting textiles in open displays in historic houses?

Location of objects within the display is important. Check the location of lighting fixtures, air vents and intakes, and entry and exit locations for visitors. Avoid placing textiles in these locations in the display. Use these guidelines:

- Place furniture cups or small discs of archival corrugated cardboard under furniture legs and casters when furniture is placed on historic carpets or floor coverings.
- Separate textiles from polished wood and other surfaces with a sheet of thin Mylar® or unbuffered archival tissue.
- Use barriers to prevent visitors from sitting on furniture or entering rooms.

Ropes and chair cords are not always completely effective in preventing visitors from touching fragile objects or sitting on furniture. Place delicate objects beyond reach. Construct chair cords so that they will give way if a visitor sits on the chair. If the cord is tight, it may stress the furniture joints and cause them to break.

3. What are special considerations for using rugs and carpets in historic house displays?

Avoid using valuable historic carpets and rugs on the floor unless they are where the public will not walk on them. For all rugs and carpets used on the floor, use the following guidance:

- Appropriate rug pads should be used. Some synthetic padding (Dacron polyester) has a non-skid surface that is placed against the floor to prevent the rug from slipping. Avoid rubber non-skid pads, jute, and horsehair.
- Remove shoes, or cover shoes with operating room "booties" when performing maintenance activities on and around historic carpets.
- Do not use vacuums with beater attachments on historic rugs. All parks should have a vacuum that is reserved for collection objects rather than routine maintenance of the building. Use that vacuum and control the suction. The plastic wood-floor attachment is usually adequate for vacuuming rugs that are not walked on regularly. Vacuum in the direction of the pile.
- Vacuum the back of the rug, padding, and floor underneath at least once a year.
- Monitor pest traps for carpet beetle and moth evidence regularly, and act quickly if an infestation is suspected.

- If visitor traffic must be directed across a carpet, use a runner to designate the walkway. A runner made from synthetic carpet is the best choice. If clear plastic runners must be used, choose one that does not have pointed tabs on the back that are meant to pierce the carpet underneath to hold the runner in place.
- Avoid traffic across the fragile fringe of any carpet.
- Consider using a reproduction carpet.

4. *How should I treat original draperies, fabric wall coverings, and upholstery if they must be replaced by reproductions?*

It is important to keep representative samples of all components of furnishing fabrics as part of the collection. This will include fringe, gimp, decorative tacks, and linings. If samples of materials like horsehair padding are kept, be sure to enclose them in polyethylene zip closure bags to prevent insect infestation. The original material, its location, method of attachment, and any other data should be thoroughly documented in writing and with photographs before it is replaced. Consult with historic furnishing experts before any disassembling or decisions on replacement are taken.

K. Exhibition of Flat Textiles

1. *How should flat textiles be displayed?*

Carefully assess the condition of an object before deciding upon a display technique. If there is any question, consult with a textile conservator for guidance. Use the least interventionist method of installing textiles in exhibition wherever possible. Use minimal stitching, or avoid stitching if possible. Pinning is sometimes an option. Use only rustproof entomological pins to secure textiles to supports.

Preparing a stitched textile mount requires skill and care. In most cases, a textile conservator should prepare a stitched mount.

Small and fragile textiles can be placed flat or on a slanted support in an exhibition case.

- Display cases must be constructed of appropriate materials (see the *NPS Exhibit Conservation Guidelines* CD available from the Division of Conservation at Harpers Ferry).
- Avoid folding textiles wherever possible.
- Minimize handling during installation and de-installation by using rigid, padded supports (see Question 2. below).

2. *What is the best way to construct padded supports for flat textiles?*

Choose a lightweight but sturdy material like archival corrugated cardboard, archival honeycomb panels, or corrugated polyethylene sheets (Core-X®) for the support. The board should be equal to or slightly larger than the size of the textile.

- Pad the board with a thin layer of polyester quilt batting or Pellon fleece.

- Wrap washed cotton fabric around the padding and board and secure the fabric to the back of the mount with double-sided archival tape or polyethylene hot-melt adhesive.
- Lay the textile on the fabric surface. Use a few rustproof entomological pins to secure the textile to a slanted support. Try to slide the pins between, rather than through, yarns.
- Avoid using pins if a textile is brittle or fragile. Instead, place the textile on its support flat in the exhibition case.

3. *What are appropriate supports for large textiles?*

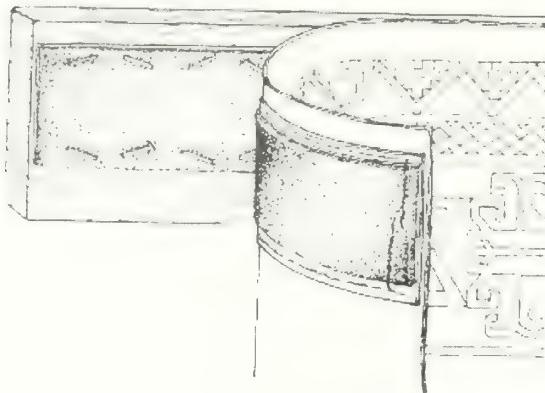
Consult with a conservator before attempting to mount large textiles for hanging. A fine silk hanging will have different requirements than a heavy wool tapestry.

- A textile should be hung in the warp direction whenever possible. Do not hang along the bias.
- The mount should distribute the weight of the textile without causing stress to any particular point.
- Roll, rather than fold, excess length for oversized textiles.
- There are several display options for large textiles, including hook and loop tape, draping, rolling, and large slant supports.

4. *What is a hook and loop tape mount?*

Hook and loop tape (also known as VELCRO®) is an appropriate hanging material for large textiles in sturdy condition. Do not use the adhesive-backed tapes. The soft (loop) tape should be machine-sewn to a strip of upholstery webbing, and the webbing hand-sewn to the back of the textile. The stiff, hook tape is attached with rustproof staples to a sealed wooden batten. The wooden batten is installed on the wall, and the two tapes pressed together (see Figure K.12). Hook and loop tapes are sometimes used on the sides of textiles to stabilize areas that are uneven. The bottom of large textiles should not be fastened down to allow the textile to expand and contract in response to small environmental changes.

Figure K.12. Installation of a hook and loop tape mount (drawing by Jian Wu courtesy of Abrams Publishers).



5. What if the textile is too long for the exhibition space?

Hang large textiles at least twelve inches above the floor to prevent damage by visitors and cleaning equipment. If a textile is too long for the space, consider the following options:

- Hang the upper edge of the textile with hook and loop tape. Allow the extra length to drape onto a platform in front of the textile. Separate the textile from the platform with a sheet of Mylar®.
- Cover an archival rolling tube with washed cotton fabric and roll the top edge of the textile object onto the tube. Mount the tube on the wall with brackets.
- Drape the textile over a fabric-covered archival rolling tube and install the tube on the wall with brackets. This method is safe for many textiles, but is not very secure against theft. If you use this mounting technique, provide a barrier or enclose the textile in an exhibition case.

6. What is a slant support?

Large textiles that are too fragile to be hung by the top edge alone can be displayed flat on a platform, or on a slanted, fabric-covered support. Use the following materials to construct large slanted supports:

- Rigid paper honeycomb panels are among the best materials to use in constructing large supports. Use aluminum channel frames to construct a support with several panels.
- Some woods and plywood can be used to construct a support if properly finished (see Technical Notes 5: Exhibit Case Construction Materials from *NPS Exhibit Conservation Guidelines* available from the Division of Conservation, Harpers Ferry).
 - Choose well-seasoned, air-dried poplar, exterior grade plywood or high or medium-density boards using formaldehyde-free adhesive.

- Finish these boards with several coats of moisture-borne polyurethane varnish and allow to dry completely.

NOTE: Not all moisture-borne polyurethanes are safe for use. Also, formulations can change without notice. Test the varnish prior to use to guarantee its acceptability.

- Place a layer of polyester quilt batting or Pellon® on the finished wood.
- Cover the board with washed cotton fabric. Fabric can be secured at the back of wooden boards with rustproof staples.
- Attach the textile to the display board with hook and loop tape mounts. If the textile is fragmentary or uneven, several short lengths of the hook and loop can be attached strategically behind the textile.

Install slant boards at a maximum angle of 15° to reduce the stress of gravity on weakened textiles.

7. What are the considerations for framing textiles?

Small and medium-sized textiles can be framed with stitching techniques, or by using a specialized mount called a “pressure mount.” A stitched mount is an interventive technique that must be carried out by a textile conservator. A conservator or technician with specialized training constructs pressure mounts.

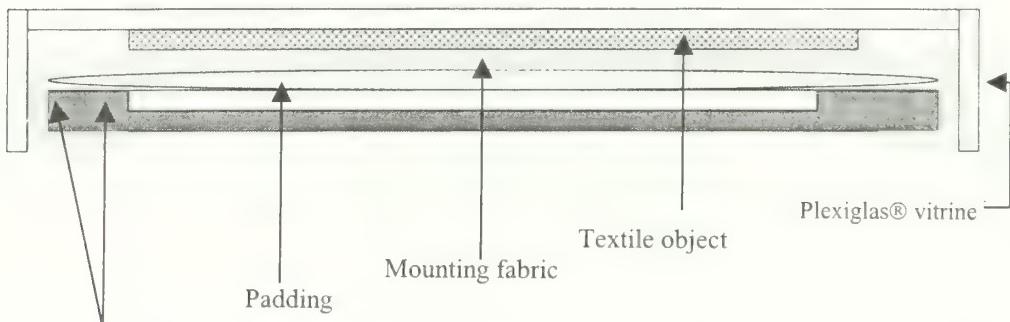
Specify the following in working with a conservator to frame a textile:

- Whenever possible, choose cotton fabric as the exhibition fabric. Linen is a second choice. Silk is a poor choice because of dye stability and poor light fastness. Wool is susceptible to insect infestation and should not be used.
- Exhibition fabric should be pre-washed to remove sizings and finishes.
- Wooden elements of stretcher frames should be made of low-resin wood (such as poplar). All wooden framing elements should be coated with an appropriate moisture-borne polyurethane varnish and thoroughly dried before use.
- Stretcher frames should be faced with archival matboard to provide a solid support for the mount.
- One or more layers of padding (thin polyester quilt batting or Pellon® fleece) should be placed behind the exhibition fabric for cushioning. Pressure mounts require several layers that are graded in size, to provide even support (see Question 13 below).
- Use Acrylic® as the glazing material. Avoid glass when working with textiles because it can break and damage the object. Specify ultraviolet-filtering Acrylic® in framing textiles if exhibition lighting conditions are imperfect.

- In a stitch-mount, make sure that the glazing does not come in contact with the textile. Archival mat board or thin acrylic strips at the edges of the frame can act as a spacer between the frame and the textile.
- Never turn under ragged edges or turn part of the textile over the edge of the stretcher. If the edges of the textile are unsightly, consider using a window mat of archival mat board to cover that part of the object.

8. *What is a pressure mount?*

A pressure mount uses the friction of the backing fabric and the glazing material (acrylic) to hold a textile in place without stitching. Padding behind the exhibition fabric provides cushioning to the textile object. This kind of mount is ideal for short-term exhibition of moderate to small-sized textiles and textile fragments. It is often the most suitable mount for somewhat brittle or fragile textiles that might be damaged by sewing techniques. A diagram of a typical pressure mount can be found in Figure K.13.



Wooden stretcher frame with archival corrugated cardboard insert

Figure K.13. Diagram of a pressure mount

9. *When do I know if a pressure mount is the most appropriate display method?*

A textile conservator should determine whether a pressure mount is appropriate for a specific textile. There are some risks in using this kind of mount even though no stitching is involved. The Plexiglas® face of the mount often carries a static charge. That charge can lift fibers from a brittle textile. In those cases, a slanted or flat mount in an exhibition case would be a better choice.

The other limit on pressure mounts is size. The maximum size of a pressure mount is limited by the size of acrylic sheet used for the face of the mount. It also is very difficult to maintain complete contact between the textile and the acrylic over a large span. Large sheets of acrylic bow at the center. It requires substantial padding, and sometimes trial and error, to create a pressure mount for a large textile.

L. Display of Historic Costumes

Wearing original historic costumes is unacceptable in a museum context. Accidents, perspiration, make-up, stress of dressing and wear, and sudden gestures or movements create excessive, immediate hazards that cannot be justified. Reproductions can be made and used for educational purposes in conjunction with appropriate display of the collection.

Each costume item should be carefully evaluated before deciding on a display method. If the seams and fabric are sufficiently strong, a mannequin may be the most appropriate choice. If the garment is fragile, it may be necessary to use a flat or slanted display. However, costumes are three-dimensional, and it is important to pad the interior of a garment to prevent folding and creasing.

Costumes need the support of a mannequin of correct size and proportion. The mannequin must represent the fashionable profile of the period to provide appropriate internal support. Certain period costumes may also require the construction of period undergarments such as bustles, hoops and corsets for correct presentation.

Bias cut garments prevalent in costume of the 1920s and 1930s should not be on extended display because of the tendency of the fabrics to stretch. Dresses of this period often have few closures and can be difficult to install on a mannequin.

No seams should be undone in order to put a piece on display.

1. Where do I find appropriate mannequins to display costumes?

There are several companies that provide both generic and custom-made mannequins for museum use (see Section R. Additional Resources below). Castoff store mannequins can sometimes be adapted for use. In particular, child and youth mannequins may be adapted to historic costumes that often are smaller in size than current adult clothing.

Simple supports can be constructed by carving polyethylene foam blocks to shape. These forms are covered with layers of batting to pad the form to the correct shape, and then can be finished with cotton knit "skin" (see Figure K.14).



Figure K.14. Polyethylene foam cut to the shape of a torso, then padded with quilt batting and covered with cotton knit.

2. How do I display unconstructed garments?

Traditional mannequins may not provide sufficient support for fragile, unconstructed garments like ponchos. An archival tube padded with quilt batting and covered with cotton fabric is a simple mount for display of these kinds of garments.

M. Conservation Treatment

The following section discusses particular considerations before any treatment is carried out either by park staff or a conservator. NPS policy emphasizes stabilization as the goal of conservation treatment. Maintenance of proper environmental control, use of appropriate storage and display techniques, and careful handling can reduce the need for costly, interventionist conservation treatments.

1. What NPS guidance is available to help me make decisions about conservation treatment?

Review Chapter 3: Preservation: Getting Started, for information on the roles of the curator/collections manager and the conservator and information on the Collection Condition Survey (CCS). Refer to Chapter 8: Conservation Treatment, for information on conservation treatment issues and working with a conservator. In addition, NPS *Management Policies*, (Dec 2000) Chapter 5: Cultural Resource Management, discusses NPS policy for conservation treatment of museum objects.

2. What kinds of treatment and maintenance can be undertaken by park staff?

Park staff with appropriate training can undertake many maintenance activities associated with textile collections, such as:

- preparing appropriate storage housings
- constructing mannequins and other support mounts for exhibition
- vacuuming textiles, costume, upholstery and historic carpets on display to remove dust and protect from insect infestation

3. What kinds of treatment and maintenance should be undertaken only by a conservator?

All **interventionist** treatments must be undertaken by a textile conservator including:

- wet and dry cleaning

- repair using needle and thread techniques
- consolidation with adhesives
- application of linings
- restorations and reconstructions
- specialized mounts (including stitched and pressure mounts)

There are many considerations in developing a conservation treatment. Some of the factors that a textile conservator will take into account before recommending a treatment are:

- no treatment is undertaken that is not absolutely necessary for the preservation, safe storage, or safe display of the object
- no treatment is completely reversible, so conservation should involve materials and methods that are the least harmful to the object
- treatment should not interfere with future research about the properties of the textile and the techniques used in its fabrication

4. *What cleaning methods are used on textiles?*

Cleaning of textile objects requires a different approach from that normally used for your own clothing. Even gentle cleaning is a drastic treatment, but it can be essential to the long-term preservation of a textile object (see Sections D.7 and D.9 above).

There are four categories of cleaning:

- surface (suction cleaning by vacuum)
- wet (cleaning with water or water plus detergent)
- dry (cleaning with organic solvents)
- spotting (treating of localized stains with wet or dry-cleaning solvents)

Wet, dry, and spotting treatments must be carried out by professionals. Vacuum cleaning is a regular form of maintenance of materials on open display, textiles being returned to storage, and newly acquired textiles before they are placed in storage or on display.

5. *What should I know about vacuuming textiles?*

Every park should have at least one vacuum cleaner that is reserved for use on museum objects. A vacuum with a HEPA filter (High Efficiency Particulate Air) that removes 99.97% of particulates 0.3 microns or larger in size is the most appropriate for removing dust and particulates from textiles (see *Conserve O Gram 1/6: Choosing a Vacuum Cleaner for Use in Museum Collections, and Tools of the Trade*). Your vacuum also should have a rheostat to allow for suction control. Most textiles should be vacuumed with very low suction. The upholstery or crevice wand is the best tool for vacuuming most textiles and upholstery; an upholstery brush works well on pile carpets.

It is easy to pick up loose threads and surface embellishments like embroidery when vacuuming. To prevent damage when vacuuming, protect the textile surface with polyester or nylon window screening. Sew cotton tape over the cut edges of the screen.

Figure K.15. Proper vacuuming technique.
Loop the vacuum hose over your arm to keep from dragging it across the textile. Place the brush down on the surface of the screen. Lift the brush to move it to the next location (do not rub the brush back and forth across the screen).



6. *What techniques are used to repair textiles?*

Many repair techniques involve the use of needle and thread to close broken seams, compensate for fabric loss, or provide support to weakened areas. Work with a conservator to determine which repair technique is appropriate for your textile. Some questions you might want to discuss are:

- What is the goal of the treatment?
- Are repairs necessary to strengthen the textile structurally?
- Are repairs necessary to aesthetically improve the textile?
- What new materials will be introduced into the textile?
- Is it more appropriate to use synthetic or natural fabrics and thread for repairs?
- What is the wash and light-fastness of new materials?
- How will new materials be distinguished from the original?
- Will repairs of seams attempt to use original sewing holes?
- Will repair fabrics be dyed to a shade slightly different than the original?
- What kind of documentation will be used to record the use of new materials?

Some fabrics like weighted silks may be too brittle for needle and thread repairs. Adhesive techniques may be the only way to safely consolidate and repair those textiles. Adhesive techniques cannot be reversed easily. They also change the drape and “hand” of the fabric. Consider all of the options carefully before deciding on an adhesive treatment. You may want to discuss the following questions with the conservator:

- Are any other consolidation and treatment techniques available?
- Is it possible to use an overlay of translucent fabric or netting to hold the damaged areas in place?
- Are there less stressful display and storage techniques that could preserve the textile without further treatment?
- Will the textile continue to deteriorate or be in danger of further damage from handling if it is not treated?

Successful conservation treatment is the result of collaboration between the curator and conservator. Conservation treatments can be expensive and time consuming. Not all treatments result in striking visual changes. A well-structured plan and continuing communication with the conservator can avoid surprises and result in the best possible outcome.

7. *What textile conservation terminology should I be familiar with when talking to a conservator?*

Following are some of the common terms and practices used in textile conservation:

- **Wet cleaning.** Using water or water plus detergents to remove soils from a textile. Water is a powerful solvent. It can solubilize and react with dyes, degraded fibers, chemical pollutants, and other materials and additives found in and on a textile. Wet cleaning requires an understanding of the:
 - physical and chemical nature of the textile
 - source and chemical character of the water to be used
 - properties of the detergent system
 - type and nature of the soils to be removed

A textile conservator will always test the dyes and finishes of a textile before attempting wet cleaning to make sure that the textile can be safely treated.

- **Dry cleaning.** Cleaning using organic solvents with or without detergents or additives. Dry cleaning may be recommended when dyes or finishes are affected by water and there is no other safe cleaning treatment.

Dry cleaning solvents are extremely volatile and should only be handled by experienced professionals. Few historic textiles can withstand conventional dry cleaning. There are few dry cleaners offering hand cleaning. If dry cleaning is recommended, the conservator should provide supervision and

oversight to the cleaner undertaking the work.

- **Spotting.** Spotting or spot cleaning is the treatment of localized stains with water or an organic solvent. Spot cleaning requires specialized equipment to prevent the stains from migrating into surrounding areas. This technique is often used to remove oily stains from a textile prior to wet cleaning.
- **Support.** The term “support” can refer to materials that provide shape and structure (such as a mannequin) or materials used to stabilize weakened areas of a textile. A support also can be a box or tray used to safely transport a textile.

A support often is a piece of new fabric used as a *patch* or *backing*. Support patches and backings are attached by stitching or adhesive techniques. The fabrics are chosen for their visual and chemical compatibility with the original, as well as light and wash-fastness.

- **Mount.** A mount is a kind of support used to prepare a textile for exhibition or storage. Unlike other kinds of supports, mounts are not permanently attached to the textile. A few examples of mounts are:
 - mannequins
 - frames
 - slant boards
 - structures that provide shape to hats
 - cavity packs
 - padded hangers
- **Lining.** Linings are protective dust covers for the back of a textile. In a garment, linings are integral to the garment structure. A conservator may add additional linings to a garment to protect the original fabric from abrasion from handling or display on a mannequin. Linings for large wall-hung textiles, like tapestries, are usually a tightly woven fabric. Linings are separate from supports, and like mounts, are not permanently attached to the textile.

N. Packing and Shipping Textile Objects

For general information on packing and shipping museum collections see Chapter 6: Handling, Packing, and Shipping. Flat textiles, costumes, and costume accessories should be packed in boxes, and the boxes packed in crates. Rolled textiles should be immobilized in crates by polyethylene foam blocks that suspend the roll in the crate (see Figure K.16).



Figure K.16. Shipping crate with suspended textile rolls. (Photograph courtesy of Harold F. Mailand)

1. Are there special considerations for packing and shipping textile objects?

The condition of a textile will determine appropriate packing and shipping techniques. The most difficult situations will occur when it is necessary to ship a fragile textile to a conservator for treatment. Work with the conservator to determine the best method. In general:

- Roll medium to large-size flat textiles if possible. Roll the textile as you would for storage. Wrap clear polyethylene sheeting around the rolled textile and seal completely with packing tape to protect against water damage.
- Fragments and small textiles can be shipped in storage mats (see Appendix I, Figure I.8 Construction of a Portfolio Mount for Archeological Textile Fragments) or padded in archival boxes of various sizes. If you are using a box, be sure to use sufficient padding to fill the box completely. Polyethylene foam blocks covered with polyester batting and muslin are good for this purpose.
- Do not use crumpled tissue in packing textiles and costume. The tissue tends to shift and compress. Use tissue folded into pillows, or batting-stuffed cotton-knit "sausages" in place of crumpled tissue to pad folds and provide interior supports.

2. Are there special considerations for packing and shipping framed textiles?

Never ship textiles framed behind glass. Replace glass with acrylic (Plexiglas®). Always wrap framed textiles in clear polyethylene sheeting and seal with packing tape to protect against water damage. Use the "box-within-a-box" method to pack and ship framed textiles.

3. *Are there special considerations for packing and shipping costume accessories such as hats?*

Three-dimensional textiles require the same kinds of interior supports for packing and shipping as for storage. The ideal packing method for three-dimensional textiles are cavity packs within archival boxes (see Chapter 6, F.4).

O. Emergency Procedures for Textile Objects

Appropriate response to emergencies from a natural disaster or vandalism should be incorporated within the park's Emergency Operations Plan (EOP). Consider the following:

- Close off the affected area and assemble sufficient personnel to deal with the problem. Unnecessary or inappropriate handling can create greater loss than the initial situation.
- Prepare a clean, dry workspace. If the emergency includes water or other liquids, have fans and dehumidifiers ready.
- Be aware of the size of doorways, stairways, corridors, and objects that cause difficulty in maneuvering to get to the workspace.
- Deal first with objects that are in danger of additional damage, such as those hanging precariously or with elongated tears.
- Water-soaked textiles are heavy and weaker than when they are dry. Carry one object at a time. Use auxiliary supports such as rolling carts or trays to move wet textiles.
- Be careful to support the whole textile. Avoid handling by edges and corners to avoid stretching and tearing.
- Collect and preserve all fragments.
- No piece should be in contact with another object.
- The immediate danger to wet textiles is dye bleed and mold. Do not attempt to dry textiles with heat. Instead, set up fans and dehumidifiers, and try to absorb excess water. Your emergency supplies should include clean toweling and boxes of disposable baby diapers for this purpose.
- If the liquid is unknown, assume the worst. It might be a corrosive or caustic chemical that could cause damage to personnel. Do not flush the textile with water as this could spread the chemicals and cause further damage and additional chemical reactions. Locate protective equipment, warn other staff of the potential hazard, and contact the park or regional HAZMAT coordinator according to the park's EOP.

P. Glossary

Constructed Garment: clothing that has been made by cutting and piecing fabric(s) together. Most Western dress is made this way (see also: *unconstructed garment*).

Costume Accessory: objects associated with costume collections including hats, bonnets, shoes, gloves, purses, fans, umbrellas, and parasols

Dry Cleaning: textile conservation treatment using organic solvents and detergents

Dye: plant materials and various chemicals that add color to textiles

Felting: the process of using heat, water, and pressure to interlock loose fibers together

Fibers: the raw materials used to make textiles. Fibers come from natural (animal and plant) and synthetic sources and may also include metals and alloys.

Finish: manufacturing process to prepare textiles for use. Finishes include dyes, lubricants, chemical compounds, mechanical treatments, sizing, water and stain repellents, mothproofing, and flameproofing.

Lacemaking: a variety of techniques that involve the intricate twisting of fine threads to form a pattern

Lining: protective dust cover for the back of a textile. Linings for garments are integral to the garment structure.

Macramé: a knotting technique using more than one strand of yarn to create fringes and edgings

Mercerization: cotton processing technique using a strongly alkaline chemical to improve dyeing, add softness, and add flexibility

Mordant: chemicals (usually metallic salts) applied to yarn or cloth to fix dyes

Mount: a type of support used to prepare a textile for exhibition or storage

Netting: textile produced from a single, continuous strand by looping and knotting

Pressure Mount: a temporary framing technique for flat textiles

Retting: soaking flax to loosen fibers from the plant stem

Spinning: twisting short fibers together to make a long thread

Spotting: treatment of localized stains with wet or dry-cleaning solvents

Support: materials that provide shape and structure, or are used to stabilize weakened areas of a textile

Unconstructed Garment: clothing that uses the rectangular shape of fabric yardage for construction. This type of garment is common in many forms of ethnic dress such as Hopi and Pueblo clothing and Japanese kimonos.

Warp: the parallel yarns stretched on a loom (lengthwise)

Weaving: making cloth by interlacing threads of the warp and weft on a loom

Weft: the transverse yarns interlacing with the warp in a pattern

Weighting: an 18th and 19th-century silk processing treatment using metallic salts to produce fuller, heavier fabrics

Wet Cleaning: conservation treatment using water or water plus detergents

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R. Additional Resources

Handling, Storage, and Care

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1030 Innes Road
Ottawa, Ontario
K1A 0C8
Canada
<<http://www.cci-iic.gc.ca/>>

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<<http://www.spnhc.org>>

National Park Service. *Conserve O Gram*. Washington, DC: National Park Service.
<http://www.cr.nps.gov/museum/publications/conserveogram/cons_toc.html>

The Textile Museum <<http://www.textilemuseum.org/care.htm>>
“A Hanging System for Textiles in Sturdy Condition”
“Storing Oriental Rugs”
“Guidelines for the Care of Textiles”
“Pestbusters”

Conservation Resources

Conservation On-Line: <<http://palimpsest.stanford.edu/>>

American Institute for Conservation of Historic and Artistic Works (AIC):
<<http://palimpsest.stanford.edu/aic/>>

Mannequins

Dorfman Museum Figures, Inc.: <<http://www.museumfigures.com/>>

Anatomic Studio: <<http://www.anatomic.net/>>

Professional Societies and Research Organizations

Costume Society of America
<<http://www.costumesocietyamerica.com/>>

Pasold Research Institute (publishers of the periodical *Textile History*)
<<http://www.maney.co.uk/textilehistory.html>>

Textile Society of America
<<http://textilesociety.org/>>

APPENDIX L. CURATORIAL CARE OF PAINTINGS

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APPENDIX L. CURATORIAL CARE OF PAINTINGS

A. INTRODUCTION

Fortunately paintings usually hang on walls out of harm's way, for they are too fragile to survive much handling. Paintings, after all, are no more than paint films, which rest, often precariously, on supports of cloth, wood, or other materials. But in addition to being fragile, paintings are very vulnerable to environmental conditions, especially relative humidity. Old paintings that have survived in good condition probably have been subjected to little handling, and almost certainly have been kept in fairly stable environments. This appendix does not cover paintings or other works of art on paper.

B. THE NATURE OF PAINTINGS: STRUCTURE AND PROBLEMS

1. Varnish

Ordinarily, paintings have been varnished. The reasons are the same as for varnishing wood furniture -- to protect and enhance the underlying surface. Standard practice until the end of the 19th century, varnishing is still a common practice today. These varnishes usually have been made from tree resins or, more recently, synthetic resins (e.g., acrylics).

Varnishes may be soft and easily scratched or abraded. Even fingers may leave visible marks. Except when dusting, any contact with a painting's surface should be avoided.

Grime slowly accumulates on a painting's surface. When there is a varnish layer, the varnish itself, except for some of the new synthetics, discolors and darkens, gradually obscuring the paint underneath. Eventually a painting requires "cleaning." Cleaning a painting is a very delicate process that involves not only removal of grime, but usually removal of the varnish layer in whole or part. The change in a painting's appearance is often striking, as brighter colors and three-dimensional effects are revealed.

Curatorial staff who have paintings in their park collection should visit a paintings conservation laboratory to see the process of cleaning and become familiar with how important it is in the understanding and appreciation of paintings.

Curatorial staff must not try to clean a painting or make any attempt at repair. Nothing should ever be put on the surface of a painting to clean it, preserve it, or for any other reason, except by an experienced conservator.

2. The Paint and Its Support

Paint consists of pigments (fine, intensely colored powders) bound together with a "medium" formulated to give the paint desirable properties when wet, and then to dry satisfactorily. The principal ingredients of paint mediums have been drying oils (e.g., linseed oil), egg, or in recent years, synthetic resins. A wide variety of other materials has also been included.

Some pigments used in artists' paints are considered permanent. They remain stable upon long exposure to light. Artists have used many other pigments, however, that eventually fade or change color. These changes, as well as deterioration of the paint medium, can be slowed down by keeping light levels below 20 foot-candles (200 Lux) and filtering out ultraviolet radiation. In most circumstances this is enough light to see paintings well.

Paint films deteriorate for many reasons. Some are in the category of "inherent vice," such as intrinsically defective materials or incompatible combinations that defy all preservation efforts.

However, most problems arise because paintings are "composite" objects whose components respond at different rates to changes in the environment. The extremely fragile paint film (both the "design" layers on top and any "priming" or "ground" underneath) usually rests on a support of canvas or wood. These materials are hygroscopic. With any change in relative humidity (RH), their moisture contents change, and consequently, their dimensions change. They expand and contract and may twist or warp. At first, young paint films can adjust fairly well to the expansion and contraction of their supports. However most paint becomes brittle with age. Cracks appear, and finally paint flakes off. Any variation in relative humidity causes this movement, but very gradual changes may give the various parts of a painting a chance to move in unison. Rapid changes preclude this safe movement and, therefore, are more destructive.

Compounding this problem is the humidity induced action of another component of the traditional oil painting. A glue size was usually put on the bare canvas to isolate it from the paint. This layer, too, is hygroscopic, and changes dimensionally with changes in RH.

Finally, the typical painting on canvas is attached to a wooden "stretcher," a framework with corners joined to permit variable adjustment so that the canvas can be kept stretched and taut. This hygroscopic, wooden stretcher adds its own movements to the others affecting a painting.

Other physical properties of materials are affected by changes in relative humidity, and these may become important factors in deterioration, if the relative humidity reaches very high or very low levels. For example, paint films become increasingly brittle as relative humidity decreases. They lose the ability to accommodate dimensional changes, and cracking results.

Paintings conservators have numerous treatments for deteriorated paint films. Usually the priority is stabilization. Stabilization includes such procedures as facing, consolidation, lining (or relining) and removing old repairs.

A facing is a protective or "first aid" measure in which tissue is attached to the paint with a suitable adhesive. The purpose is to hold the paint in place until an appropriate treatment can be performed.

Consolidation involves reattaching loose paint to its support. Many different techniques and adhesives are used.

Lining (or relining) entails attaching a new piece of fabric or other support material to the back of the original canvas to reinforce it. Again, there are many ways to do this.

Removing old repairs is necessary in some cases when they are contributing to deterioration, as when a patch distorts surrounding paint.

Restoration is often necessary, in addition to stabilization. The purpose of this phase of treatment is to make a painting more accurately understood or appreciated by removing misleading repairs, or by making damages less conspicuous. Cleaning, as described above, is often an important part of the restoration process.

Paint added during an earlier restoration may no longer match, or may be excessive, according to current conservation standards. Usually it is feasible to remove this added paint. Discuss this procedure with your conservator. Ensure that the total extent of previous restoration is delineated and documented.

Missing areas can be made less distracting. In the past it was common practice to conceal losses by extensive repainting, going beyond what was actually missing. Today this "overpainting" is avoided. Conservators carefully "inpaint" so that original paint is not covered.

Discuss any proposed inpainting with the conservator. For one thing, inpainting takes time and can be an expensive process. Perhaps the painting really only needs stabilization. On the other hand, carefully applied inpainting may be essential in making a painting exhibitible. In most cases damages should be concealed sufficiently so that they do not distract from the whole. Seeing and appreciating the extant original of a painting is the point of doing any restoration at all.

It is also important that the conservator use a paint for "inpainting" that does not discolor and can be removed readily in the future, with no harm to the original paint. There is no reason to attempt to duplicate the original paint medium, such as using oil paint to inpaint an oil painting. Good results can be obtained with paints that are safely reversible.

C. PREVENTIVE CONSERVATION OF PAINTINGS

1. Environment

a. Relative Humidity (RH)

Maintain a stable level; avoid extremes. Aim to keep the RH level within 5%, plus or minus, of the set point. If the set point must be changed, do it gradually, over weeks or months, so that the various hygroscopic materials in paintings can adjust in unison.

Maximum safe RH is 65%. Higher levels promote mold growth. Circulate the air to disperse stagnant pockets of dampness. Watch out for cool walls (usually external) where RH in the space behind a painting can be higher than room level.

Minimum safe RH is 40%. Below this point is the danger zone, except in arid climates where paintings may have adjusted to lower levels. In winter, heated buildings climatically resemble desert environments, with RH at 20% or below. To raise RH levels, turn down the heat! A reading of 30% RH at 80°F, will be increased to better than 40% RH at 70°F, and to a very healthy 50% RH at 65°F. Remember that there is soot or dust above a fireplace or radiator and also a warm wall which creates a "microclimate" dryer than the rest of the room, perhaps dangerously so. Hot lights, even picture lights, do the same.

b. Temperature

For paintings, temperature is less important than relative humidity. Maintain a temperature level below 80°F and above freezing. Within this range, the lower the temperature the better. However, a painting may be harmed by condensation if it is moved quickly from a cool area to a warm area. Temperature changes always should be gradual.

c. Light

A light level of 20 foot candles (200 Lux) is enough for almost all circumstances. Ultraviolet (UV) radiation should be filtered out of light sources, such as daylight or fluorescent lights, that contain more UV than the normal incandescent lamp (75 mW/lumen).

2. Framing/Hanging

- a. Is the painting secure in its frame? Check on this, especially when a painting is to be moved. A good method is to use bendable metal straps (e.g., brass mending plates) and screws to secure a painting in its frame.
- b. Is the frame hardware adequate and secure? Screw eyes tend to work loose over the years and should be checked periodically.

"Mirror hangers" work well. For larger paintings, use two on each side, with one or two picture wires apiece.

- c. Is the supporting wire strong enough and securely attached? Number 8 wire (about 1/8" or 2.5 mm in diameter) should be considered minimum, and heavier paintings need two or more wires. Replace frayed, partially broken wire. Inspect picture wires periodically as part of the museum housekeeping program.
- d. Instructions for attaching picture wire to a hanger are outlined and illustrated in Figure L.1.
- e. Does the wall (or storage screen) provide secure attachment? A wide variety of hooks, nails, screw eyes, anchor bolts, toggle bolts, molly bolts, etc. may be used, depending on the type of wall and the weight involved. What matters is that the wall/hardware combination can support the weight indefinitely. Periodically check this.
- f. Does the painting have a protective backing of cardboard (or Fome-Cor®)? This is especially important when a painting is off the wall for any reason.

3. Storage

- a. Let nothing rest against a painting's surface which might poke, tear, deform, or adhere to it. This applies as well to the back of a painting on canvas.
- b. See NPS Conserve O Gram 12/3: "Painting Racks" for information on building "screens" for storing paintings safely, off the floor, yet easily accessible. Similar screens are available commercially.
- c. Separate paintings with cardboard if they lean together in a bin or a stack against the wall. Do not permanently stack paintings against a wall exposed to the outside of a structure.
- d. Cushion and protect frames, using materials such as polyethylene foam or strips of carpet, whenever frames are off the wall. Padded blocks are useful when working with frame paintings. Simple ones can be made from pieces of wood (e.g., "2x4's") by cutting foam or cotton batting to fit a side and stretching fabric over it. Refer to Canadian Conservation Institute Notes 10/2, "Making Padded Blocks" for techniques for making padded blocks.

The instructions for attaching picture wire to a frame's hanger are outlined in the below figure. Each step is keyed to the illustration by the indicated number.



1. Attach picture wire to hanger (or screw eye) by inserting the end of the wire through the loop in the hanger.
2. Wrap the wire around the loop and through the loop again, pulling the wire snug against the loop.
3. Tightly wind the end 4 to 5 times around the wire next to the hanger.
4. Wind wire loosely around itself several additional times.
5. Cut off the surplus wire.

Repeat this procedure for the hanger on the other side of the frame. Ensure that there are no loose loops or spaces in the finished knot.

Figure L.1. Steps for Attaching Picture Wire to a Frame's Hanger

- e. Use cushions or boards to keep paintings off the floor. This makes housekeeping easier and helps keep paintings out of the dust and debris that tends to accumulate on floors, as well as any water leaking from pipes or humidifiers. Refer to Canadian Conservation Institute Notes 10/2, "Making Padded Blocks." This publication is listed in Section D of this Appendix.
- f. Cover paintings stacked against a wall with polyethylene, paper, or other sheeting to keep dust off.
- g. Avoid possible water leaks, e.g., from overhead pipes. Drape plastic sheeting over stored paintings if there is any chance of water dripping from above.

4. Touching and Vandalism

Paintings on exhibit are tempting targets for touching and vandalism. There are many ways to prevent or reduce the possibility of these hazards.

- a. Park staff may be stationed in the immediate vicinity of paintings.
- b. Framed paintings usually may be fitted with glass or acrylic sheet (e.g., Plexiglas) inserted in the rabbet of the frame and separated from the painting itself by a "spacer" at the edges.
- c. An acrylic sheet case may be fitted around the painting and attached directly to the wall.
- d. Paintings may be put in exhibit cases.
- e. Paintings may be placed out of reach by using guard rails, stanchions and ropes, platforms, furniture, or other physical barriers.
- f. Appropriate alarm systems may be installed to detect when a painting is touched or lifted or both.

5. Handling

In addition to general rules for object handling discussed in the Chapter 6 of this handbook, observe the following rules:

- a. Never touch the paint surface or push on the canvas from the reverse.
- b. Make sure a painting is secure in its frame before moving or carrying it.
- c. Carry no more than one painting at a time. Get help in carrying a larger or heavier painting.

- d. Do not lift paintings by the top of the frame or stretcher. Carry with one hand on each side; or one on one side, and one on the bottom.

6. Monitoring and Documenting Condition

Since paintings are interacting constantly with the environment and intermittently with people, it is important to monitor them for signs of wear and tear, vandalism, or other changes. Each painting should have ongoing condition record, with dated entries. Good photographs are very desirable, for conditions may be too complex or subtle to describe in words. Graph paper makes a convenient form for recording the location of cracks, tears, holes, abrasions, scratches, rubs, etc.

a. Watch for Signs of Loose Paint

Use good light, both from normal lighting angles and especially from the side, at a "raking" angle over the surface. Look for the raised corners or edges of paint along cracks. Paint usually detaches itself gradually and can be saved if a conservator is consulted in time. Cracking may not mean paint loss is imminent, but close monitoring is advised, with periodic examinations by a paintings conservator. Some "cracks" are not threatening (although they may well be disfiguring): sometimes paint moves or shrinks during drying, and separations appear without any paint actually being loose or likely to flake off. These are "drying" or "traction" cracks.

- b. Wear and tear is difficult to monitor since it occurs in small increments, insidiously altering museum objects. Yet small scratches, rubs, chips, stains, fingermarks, and other blemishes are real damages, often irremediable. Examine paintings closely for signs of wear and tear, and watch out for any circumstances in which it may be occurring, whether in storage or in exhibit areas.
- c. Vandalism should be detected immediately, so that corrective treatment may be prompt, but also to forestall further incidents.
- d. When damage such as a scratch, tear, or dent is discovered, look closely to assess the situation. However, do not touch the surface of the painting. In these circumstances the slightest touch can dislodge paint. Similarly, do not try to remove foreign material from a painting's surface. Contact a paintings conservator as soon as possible.

Paintings should be examined periodically. Take a daily walk through the exhibit and storage areas and look for any obvious problems, such as vandalism. A closer inspection of each painting for loose paint or any new signs of damage or deterioration should take place on a monthly basis. A good flashlight is very helpful. Use raking and reflected light. Refer to Canadian Conservation Institutes Notes 10/7, "Condition Reporting - Paintings," listed in Section D of this

appendix, for the methods of examining a painting for its condition. Record your observations and any actions taken. Have a paintings conservator conduct a Collections Condition Survey of all paintings in the park's collection. The staff persons who ordinarily do the daily "walk-throughs" and monthly inspections should work with the paintings conservator during the site visit.

7. Dusting

Dusting is seldom necessary in clean environments, since paintings are usually in a vertical position. If dust is noticeable, proceed with extreme care, as paint can be dislodged or the surface scratched. Preferably have a paintings conservator do the dusting or provide instruction on how to do it. In any case, use good light and make sure that no paint is loose. Use only a very soft, clean brush. Some animal hair artist's brushes (e.g., sable) are suitable. A convenient size is 2-3" wide. A good source for this brush is an artist supply store. Start at the top, brushing downward gently and checking closely, from different angles, to ensure that the surface is not being scratched or marred.

D. EMERGENCY PROCEDURES FOR PAINTINGS

Refer to Chapter 8, Section F for procedures for emergency treatment and handling of museum objects. Specific guidelines for handling paintings in an emergency are as follows:

1. Do not attempt to remove mud.
2. Drying may involve serious paint loss - watch for loose flakes.
3. If paint is loose, store painting horizontally (face-up), supporting canvas from behind, if it appears weak. Otherwise, store vertically.
4. Keep each painting separated from others.

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APPENDIX M. CURATORIAL CARE OF CELLULOSE NITRATE NEGATIVES

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Appendix M: Management of Cellulose Nitrate and Ester Film

A. Overview

1. What is cellulose nitrate (nitrate)?

Nitrate refers to a group of early transparent plastic film supports that were most common between 1910 and 1950. Created as an easy-to-handle replacement for heavy and awkward glass plates, gelatin film, and paper negatives, nitrate film was used for still photographic negatives and transparencies, as well as motion picture film. Most nitrate film consists of a flexible sheet or roll of cellulose nitrate (nitrate) film base with a silver gelatin photographic emulsion (image bearing layer) on top. During the 20th century, amateur and professional photographers and filmmakers used nitrate more frequently than any other film support to hold the emulsions of their negative and film images.

Cellulose nitrate polymers, initially called gun cotton, were first synthesized over 150 years ago for use in the manufacture of military explosives. Later, cellulose nitrate polymers were treated with camphor to produce some of the earliest plastics. Celluloid, an early plastic replacement for ivory, was made into hairbrushes, billiard balls, toys, and a variety of home products. In the late 1940s, cellulose nitrate lacquers, adhesives, and metal coatings became popular, many of which are still in common use today. More recently, printing inks; plastics; coatings for stone, metal, and ceramics; and common adhesives, such as DUCO Cement and UHU All Purpose Clear Adhesive, have used cellulose nitrate polymers. Cellulose nitrate polymers vary in the amount of actual cellulose nitrate in their composition, from collodion photographic emulsions with a 10.5% concentration, to photographic flexible film bases with a 12% concentration, to explosive weapons-grade gun cotton with a 12.5% concentration.

If deteriorated, nitrate may be yellowed, tannish, stained, bleached, sticky, brittle, blistered, pungent-smelling, or powdery, depending upon the stage of deterioration. Nitrate photographic film has sometimes been called:

- celluloid
- nitrocellulose
- flammable film
- pyroxolin
- flam film
- cellulose nitrate

Nitrate is often confused with the cellulose ester films, including acetate, diacetate, and triacetate negatives, which deteriorate in a similar fashion. Cellulose ester films are described in Section B.1. Paper-based photographs are **never** nitrate. Specific tests have been developed to identify nitrate. See

Section B.6 below for more information on these tests. The modern replacement for nitrate and acetate films is polyester, a stable plastic.

2. *What are nitrate photographic negatives and transparencies?*

In the United States, nitrate-based still photographic negatives and, less commonly, positive transparencies were produced between 1889-1950. Both amateur and professionals photographers used nitrate film for fine art photography, photojournalism, portraits, travel photography, and technical photography such as aerial, dental, legal, and medical photographs (both X-ray and standard negative and transparency images). Manufacturers such as Agfa, Ansco, Defender, DuPont, Hammer, and Kodak produced nitrate films. See Table 1 (Section A.4) to learn when different formats and types of nitrate still negatives were first introduced or last available in the U.S.

The earliest nitrate film (1889-1903) has a thin (<8/1000 of an inch or <8 mil) nitrate film base and gelatin coating on only one side; therefore it tends to curl. This earlier film is more stable than later professional film, which has a thicker nitrate base (8 mil) to keep the film flat during processing. Professional negatives are the least stable of the still negatives. On occasion, rolls of 35mm-nitrate still negative film are confused with motion picture film when the roll film remains in its original roll format. Roll films may be identified by their frame numbers, which motion picture films lack. Nitrate sheet and cut film have a border pattern (frame-like edge) that doesn't occur consistently around the image. On the long edge of the film, the border ends about an inch from the end of the image, while the image reaches to the film edge in this area.

Most nitrate still images are flat sheets of transparent flexible film containing negative or positive photographic images in a wide variety of sizes (formats) from 35mm to greater than 16" x 20". Included in this category are:

- *aerial film* (ranging in size from 4" x 5" to 8" x 10"), which is easily identifiable by subject content
- *X-ray film* (emulsion coated on both sides of the base), which is also easily identifiable by subject content
- *film packs* (up to 5" x 7"), which are recognizable by the lightweight film base, a wide short-edge border (frame-like edge of the image) and thinner long-edge border, and the adhesive or paper residue from a pull tab that may be present on the short border.

3. *What is nitrate motion picture film?*

Nitrate motion picture film consists of varying length strips of flexible film with perforations along both side edges, which allow the film to be fed through a camera, projector, or film editor. Unlike slides and negative roll film, however, the motion picture film frames have no sequential frame numbers. Nitrate motion picture film was used to create educational film strips, amateur films, training films, travel films, and amateur and commercial motion picture releases, both silent and with sound.

Nitrate motion picture film can contain positive or negative motion picture images. These images may be either color or black and white, generally showing motion in sequence from left to right like a comic strip.

Most nitrate motion picture film is thinner than negative film but relatively less stable as it is stored tightly rolled and in large quantities, which hastens deterioration.

Nitrate motion picture film was originally available between 1895 and 1951. These nitrate motion picture film availability dates are not absolute, however, as some filmmakers had stockpiles of this film and continued to use it for some years. See Table 1 below for precise dates when specific types of nitrate stopped being manufactured in the U.S.

4. *When was nitrate used in the United States?*

American amateur and commercial still photographers used nitrate-based film most frequently between about 1908-1939, although nitrate film was available between 1889 and 1951. Specific dates vary for some gauges and formats (X-ray, aerial film, and roll film). The history of nitrate and other film types produced in the U.S. is chronicled below.

Table 1: A History of Nitrate Film

- 1889 – Nitrate film is developed for roll film (not 35mm), sheet film, film pack film, X-ray film, and professional 35mm motion picture film.
- 1895 – Nitrate commercial motion picture film is available.
- 1900 – Nitrate motion picture film becomes commonly available.
- 1903 – Nitrate film is given a thicker nitrate film base and a gelatin backing on both sides.
- 1908 – Kodak introduces cellulose acetate “safety” roll film negatives for still cameras.
- 1909 – The National Board of Fire Underwriters develops rules for nitrate handling and storage.
- 1920 – Nitrate 35mm roll film and aerial film are available.
- 1920 – Acetate amateur motion picture film is available in 8mm and 16mm formats.
- 1920 – Nitrate negative film commonly replaces glass plate negatives.
- 1923 – Kodak introduces cellulose acetate amateur motion picture film.
- 1925 – 35mm nitrate still negative film begins to be available and cellulose acetate film becomes much more common.
- 1930 – Acetate sheet film, X-ray film, and 35mm roll film become available.
- 1933 – Last year Kodak manufactures nitrate X-ray film in the U.S.
- 1935 – Nitrate still negative film begins to be replaced by cellulose acetate “safety” film.
- 1937 – Cellulose acetate film begins to be replaced by cellulose diacetate.
- 1938 – Last year Kodak manufactures 35mm nitrate still negative roll film in the U.S.
- 1939 – Nitrate still negative film is largely replaced by “safety” films.
- 1939 – Last year Kodak manufactures portrait and commercial sheet nitrate film.
- 1940 – Acetate aerial film and roll film (other than 35mm) is developed.
- 1942 – Last year Kodak manufactures aerial nitrate film in the U.S.
- 1947 – Cellulose diacetate still negative film begins to be replaced by cellulose triacetate.

1948 – Kodak introduces triacetate motion picture films. *Note:* If your print is edge marked “safety,” it dates after 1948.

1949 – Triacetate motion picture films are now in common use.

1949 – Last year Kodak manufactures nitrate film packs in the U.S.

1950 – Last year Kodak manufactures roll film in sizes 616, 620, and 828 in the U.S.

1950 – Acetate film pack and professional 35mm motion picture film become available.

1951 – Last year Kodak manufactures professional 35mm motion picture film in the U.S.

1951 – After this date, all camera negative separation films (Technicolor camera negatives, master positives, matrices, and release prints) are produced in triacetate. Most film produced before this date in the U.S. is unstable.

1960 – Polyester sheet film, X-ray film, and aerial film become available.

1960s – During this decade, most Technicolor™ films are on polyester support matrix films.

5. Why should I be concerned about nitrate film?

As it deteriorates, nitrate gives off highly acidic nitrogen oxide gases, particularly nitric oxide, nitrogen dioxide, and others, which either escape into nearby areas—threatening staff, buildings, and collections—or stay captured in the sealed storage area. Unless allowed to escape, these gases build up, causing an autocatalytic reaction that speeds decomposition of the original nitrate materials. Since the reaction produces heat, which further acts on the available gases and humidity, the environment around the nitrate rapidly becomes toxic. Nitrate poses a variety of problems, including:

- **Health problems:** All nitrate film deteriorates naturally over time, unless kept in very cold storage. Deteriorating nitrate film gives off gaseous byproducts, including nitric oxide and nitrogen dioxide gases, which may threaten researcher and staff health. Health threats include:
 - eye irritation
 - headaches
 - nausea
 - rashes
 - respiratory irritation
 - skin irritation
 - swollen glands
 - vertigo

All human exposure to nitrate should be limited in duration and monitored for side effects. Staff working with nitrate must keep track of and limit the number of hours of exposure and use special equipment when working with nitrate. See Section C.7 for details.

- **Safety problem:** As nitrate decomposes, it releases heat (an exothermic reaction) and acidic gases, including nitric oxide and nitrogen dioxide. In the presence of high humidity or water vapor, the nitrogen dioxide deterioration byproducts can produce nitric acid, a very corrosive compound. Large quantities of nitrate, particularly bulk quantities of roll film (20,000 linear feet or more), motion picture (20 films or more), or X-ray film (875 X-rays or more than 75 pounds), when housed together, will deteriorate at an ever-accelerating rate due to the build up of heat and acidic gas deterioration byproducts. See Section C.7 for guidance on how to work with nitrate.

If you store quantities of deteriorated nitrate, it may spontaneously ignite at temperatures of 100°F (38°C) or higher. Undeteriorated nitrate ignites at about 266°F (130°C). **Burning nitrate produces toxic gases, such as carbon monoxide and nitrogen peroxide that pose a severe threat to life.** These toxic gases have killed many individuals in theaters, clinics, and storage structures. In 1929, gases from burning X-rays during a clinic fire in Cleveland killed 125 people.

Since nitrate contains chemically combined oxygen, it produces its own oxygen as it burns. Once burning, nitrate roll film or motion picture film is almost impossible to extinguish as the center of the film burns at the same speed as the exterior due to the nitrate's ability to use the chemically combined oxygen. Nitrate is a serious threat to the safety of all people that work in the same building, all collections stored in the building, and all historic structures nearby. Nitrate can burn in a closed film can, under water or sand, and despite modern fire suppression systems including dry chemical and foam fire extinguishers, halon, carbon dioxide fire systems, and similar extinguishers. See Section D for guidance on how to avoid nitrate fires. Nitrate can also suffer from the standard deterioration problems of film, such as mold, insect infestations, and vermin infestations, all of which pose additional health hazards. See *Museum Handbook*, Part II, Appendix R: Curatorial Care of Photographic Collections.

- **Structural safety problems:** As well as being toxic, nitrate fires are known for their intensity and explosive force. Nitrate burns at a combustion rate 15 times greater than that of wood. While burning, nitrate produces toxic and flammable gases—including carbon monoxide and nitrogen peroxide.

Just five pounds of nitrate (1 reel of motion picture film or 125 negatives larger than 4" x 5" in size) can release over 25 cubic feet of carbon monoxide. These gases are produced at such a rate that they place tremendous pressures on building structures, frequently leading to structural collapse. Nitrate fires usually burn until all fuel is consumed, often accompanied by explosions.

- **Collection problems:** As it deteriorates, nitrate gives off gases that deteriorate other materials, such as paper, leather, fabric, and wood, as well as stone and some metals. The nitric acid created as the result of nitrate deterioration corrodes metal, makes gelatin binders (part of the film image-bearing emulsion) sticky, and fades silver images.

Even when in refrigerators or freezers, nitrate should not be housed in general museum or archival storage areas, work spaces, or general office spaces for more than five years) as some fumes are still given off. Nitrate is a threat to the survival of collections housed in the same or nearby buildings. See Sections C.11 and C.12 for guidance on how to house and store nitrate.

6. *What values do nitrate films have for parks?*

Nitrate negatives and motion picture film forms the largest portion of the visual record of the early 20th century. This material has value for a wide variety of purposes, including:

- ***Informational value:*** Nitrate film provides meaningful data and information essential for tracking how parks have changed over time including:
 - activities and events
 - archeological sites
 - buildings and restoration of structures
 - geology
 - historic landscapes and vegetation
 - human impact on ecosystems and fauna

Nitrate captures the ephemeral, transforming it into a record that can be interpreted, evaluated, utilized as data, and transformed into information and knowledge. Don't lose this information through neglect or disposition. High quality copies can have almost as much informational value as original nitrate. If you have a high quality copy, such as an interpositive copy or a duplicate negative in good condition, you don't have to keep the original negative if it has only informational value.

- ***Artifactual value:*** Materials that are rare, interesting, or outstanding examples of photography or filmmaking have artifactual value. Some nitrate negatives, for example, such as those by Ansel Adams, Lewis Hine, or Carleton Eugene Watkins, are important artifacts in their own right because of their excellence as visual objects.

Nitrate with high artifactual value will generally have some of the following characteristics:

- fine composition
- sharp focus/resolution (unless purposefully impressionistic)
- good tonal values
- excellent depth of field (clear focus and image depth in both foreground and background areas)

- lack of obvious blemishes such as smudges and dust spots
- representation of the subject matter in a visually arresting, interesting, or surprising way
- good contrast (clear bright highlights and deep dark shadow areas)
- good range of clear details, even in the dark shadow and bright highlight areas

These high artifactual value nitrate materials must be preserved as major assets until they become so deteriorated that they have lost their functionality and become a threat to other materials. Poorly composed, unfocused, and muddy images would not qualify as having high artifactual value. Generally speaking, high quality copies **don't** capture all the artifactual value of an original photograph. Copy and keep undeteriorated original nitrate that has high artifactual value.

- **Evidential value:** Some nitrate negatives serve as either legal or historical proof of an activity, event, occupation, or action, such as law enforcement footage of an illegal activity. The state and federal laws have specific requirements for how evidential materials must be maintained prior to a court case. Such legal requirements might include:
 - an unmanipulated image that has not been dodged, burned, retouched, tinted, or airbrushed, either in the darkroom or afterwards
 - documentation on when, where, how, why, and by whom the image was taken and what it documents
 - a record of a continuous chain of custody by the creator (photographer or his or her employer)

This evidential nitrate should be kept for its value as legal and historical evidence, although while still active, it is unlikely to be found in museum collections. Legal records may eventually become unnecessary; however, **historical proof is always necessary**. Nitrate film that serves as historical or legal proof must be copied with particular care to ensure that it doesn't lose its usefulness as evidence. You may need to consult with a lawyer or historian before disposing of these legal or historically evidential materials, even after copying. In some cases you may be bound to maintain the original in perpetuity, or at least until it is deteriorated beyond stage 3. See Section B.13 for a description of the stages of deterioration. Copy and keep this original nitrate film. Consult your solicitor for guidance on preserving the evidential value of the original in your copy.

- ***Associational value:*** Some nitrate has importance for its relationship to a notable individual, group, event, place, or activity, such as the images taken by or of presidential family members, famous authors, famous generals, or other notables. Associations might include:
 - an individual or group who created, owned, or was shown in the image, such as Franklin D. Roosevelt
 - an activity, such as a parade, staff-training, or a celebration
 - a movement, such as Suffrage, Emancipation, or Impressionism
 - a geographical locale, such as a particular park site
 - an era or event documented, such as the Spanish-American War or Inaugural Day

Generally speaking, associations are more powerful for original materials than with copies. Maintaining the original nitrate will maintain that direct link to the associated individual or group. Copy and keep undeteriorated original nitrate with high associational value.

- ***Administrative value:*** Some nitrate is essential for the day-to-day operation of the parks. This includes nitrate film that documents museum collections; nitrate film used as resource materials for park publications; and nitrate film that serves as documentation of land boundaries, flooding, or forest fire damage. Generally speaking, these materials eventually become part of the park museum collections because of their informational content, if, for example, they contain baseline data on ecosystems. These materials, once copied, inspected, deteriorated, and deaccessioned may be disposed of as NPS hazardous waste according to Environmental Protection Agency (EPA) guidelines. Work with a NPS hazardous waste coordinator. See C.16 and C.17.

B. Identification and Evaluation of Historical Nitrate and Cellulose Ester Film

1. What transparent flexible film bases have been produced?

During the late 19th and early 20th century, there were a number of transparent film bases created, including:

- ***Cellulose nitrate (nitrate):*** Described in Section A.1.
- ***Cellulose ester (acetate) family of safety film bases:*** The cellulose ester family of film bases is usually referred to as triacetate, diacetate, or acetate or is simply called safety film. Though developed to be permanent film bases, unfortunately these films were no more stable than nitrate. Their maximum life expectancy (LE) is 100 years at an average room temperature of 70°F. The major difference between the nitrate and cellulose ester family of film bases is that the cellulose ester films are **not** as flammable. Because of the presence of acidic

decomposition byproducts, these cellulose ester film types should be isolated, reformatted, and placed in cold storage as they deteriorate. **Most 20th century color film (slides and negatives) is cellulose ester, even film and transparencies being produced today.** Manufacturers such as Agfa, Ansco, Defender, DuPont, Hammer, and Kodak have produced or are producing cellulose ester films. See Sections B.2-B.4, and B.6.

- ***Cellulose acetate (acetate, cellulose acetate propionate, and cellulose acetate butyrate):*** Developed about 1935, these were the first of the “safety” cellulose film types used to replace nitrate. The major improvement over nitrate was an ignition temperature above 800° F.
- ***Cellulose diacetate (diacetate):*** This is the second of the safety cellulose film types, used to replace nitrate film and acetate around 1937. Like acetate, diacetate is no longer-lived than nitrate. Diacetate films discolor, shrink, and become progressively more brittle over time. Storage environment, particularly temperature and humidity, greatly affects the life of this film. Cellulose diacetate began to be replaced by triacetate in 1948.
- ***Cellulose triacetate (triacetate):*** This is the last of the cellulose ester films that replaced nitrate around the 1950s. It was first available in 1948 as motion picture film and commonly in use by 1949. As early as 1960, reports began to filter in that cellulose triacetate film was not permanent when stored under warm and humid conditions.
- ***Polyester (polyethylene terephthalate):*** This refers to a clear neutral plastic film used for film bases since the 1950s. Polyester is a long-lived and durable film base. Films marked “Estar” or “Cronar” are polyester. Manufacturers such as Agfa, Ansco, Dupont, and Kodak produce or have produced polyester films. Polyester is not particularly flammable, does **not** give off dangerous gases, and has a maximum life expectancy (LE) of 500 years.

2. Does cellulose ester film deteriorate?

Yes. All flexible films in use before 1950 deteriorate. As cellulose ester films age, deterioration lowers the pH of the cellulose ester’s emulsions (image-bearing layer), causing fading and film-base deterioration. Like nitrate, these films become brittle as they age. Cellulose ester film may develop crystals or bubbles on the emulsion surface of the images.

The classic cellulose ester deterioration patterns are “channeling,” in which the film image layer (emulsion) forms raised blisters and tunnels on the film base and “vinegar syndrome,” described in Section B.3 below. Ultimately, the only effective preservation solutions are reformatting and inspection of the original, followed by cold storage of any undeteriorated originals of continuing value. For more guidance and a rating system for comparing the various types of value, use, and risk, see *Conserve O Gram (COG) 19/10, “Reformatting for Preservation and Access: Prioritizing Materials for Duplication.”*

3. *What is the vinegar syndrome?*

As the cellulose ester films (acetate, diacetate, and triacetate) deteriorate, they chemically decompose, producing acetic acid. Acetic acid is the cause of the well-known “vinegar” smell frequently noted around collections of acetate, diacetate, and triacetate. Like nitrate, the decomposition is autocatalytic, meaning that the presence of acidic decomposition byproducts near the original film will speed further decomposition. Using sealed or closed containers hastens this deterioration process by maintaining deterioration byproducts and acetic acid gases next to the film. Like nitrate films, cellulose ester films should be isolated for cold storage. Handle cellulose ester film carefully, as acidic gas byproduct build-up near the film can also be a health hazard.

4. *What does deteriorated cellulose acetate, diacetate, and triacetate film look like?*

Most cellulose ester film types deteriorate in the following characteristic ways:

- *slight film curl* (**Note:** This is also exhibited by nitrate from the 1889-1903 era)
- *vinegar-like or acetic acid smell*, which grows stronger as the film deteriorates
- *film shrinkage*, which can change the film's dimensions
- *film brittleness*, although it doesn't turn amber-colored like nitrate
- *some warping and planar distortion*, so that the film is no longer flat, but instead has raised areas
- *bubbles* in the film emulsion
- *channels of raised film emulsion* on the film surface (as the film emulsion separates or lifts from the film base it produces channels, tunnels, and large blister-like features)
- *silvering-out* or metallic mirroring or image tarnishing that begins to occur in the densest image areas

Note: Only nitrate has rainbow effects that appear in the darkest and most silvered-out areas of the image. Acetate, diacetate, and triacetate films lose image detail and look dark and reflective when they silver-out; they don't have rainbow-like-patterns.

5. *How do I identify nitrate materials?*

There are several ways to identify nitrate materials, including:

- **By date of manufacture:** Table 1 in Section A.4 provides a review of the dates during which various types and format of film were most commonly used. Most film negatives and motion picture film made in the United States before 1951 are suspect as being potentially nitrate. Additionally some negatives and films made in France during World War II were nitrate.

- **By internal evidence:** Internal evidence is the best way to identify nitrate. There are several common types of internal evidence, including:
 - **Edge markings:** Edge markings or edge prints are actual words on the borders of film that indicate the film name or type. Some manufacturers edge-marked their nitrate film with the word "nitrate," while they marked other film with specific brand names or types of nitrate film, such as "Eastman Nitrate Film." If you are dealing with an original negative, you can depend upon the "nitrate" edge marking. **Note:** The marking "safety film" indicates that the film is cellulose ester (acetate, diacetate, or triacetate), while films marked "Estar" and "Cronar" are polyester.

Occasionally, when copying nitrate film to a safety base the nitrate edge markings also were copied. These copies of nitrate on safety base would have both "nitrate" and "safety" edge markings, thus alerting you to their "safety" status. So, the presence of the word "nitrate" as an edge marking is **not** conclusive proof that the material is nitrate if you are dealing with a copy image. Look for V-shaped notch codes (punches taken out of an image border in a particular configuration to indicate the film type to photographers working in a darkroom) in addition to the word "nitrate" for more conclusive proof that the image is nitrate (see notch codes below). Your best use of edge markings is to look for the word "safety." Assume that pre-1950 film or negatives not marked with the word "safety" are nitrate. Also assume that unmarked film produced prior to 1950 is nitrate, until you can test it.

Flexible film-based negatives (not glass, paper, or metal based negatives) and motion picture film produced between 1890-1950, which don't have the words "safety film" marked on them, generally are nitrate. Use this distinction as one easy way to identify nitrate.

- **Notch codes:** Notch codes are small punches taken out of the border of nitrate, developed to help photographers identify the film type in the dark room. These codes varied over time by manufacturer, process, and format of film. Kodak "V" notch codes, used in combinations of up to three notches, designated that the film was nitrate. When the earliest safety film appeared, the outermost notch became a rectangular "U." After 1949, Kodak reused the old "V" notch codes for safety film. Notch codes provide uncertain guidance and are best used in conjunction with other internal evidence.
- **Odor:** Nitrate film has a pungent nitric acid smell as it deteriorates and may have a camphor-like odor when it burns. These odors should not be confused with the vinegar-like acetic acid smell of deteriorating acetate, diacetate, and triacetate safety film.

- ***Yellowish-brown base color:*** As it deteriorates, nitrate film changes in color from clear and transparent to a distinctive dark amber tone. To determine if the base has this tone, look along the border or edge of the film where there is no emulsion or cut a small chip from the edge of the film and place the film chip in water. After about 15 minutes, when the emulsion has softened, scrape it to see if the film is amber in color. If it is, the film is probably nitrate.
- ***Base brittleness:*** Deteriorated nitrate is very brittle. You may cut a tiny chip off the border of a piece of nitrate film and try bending it. Compare the film's resilience to that of a piece of contemporary film by flexing it gently. Nitrate will be significantly more brittle.
- ***Emulsion stickiness:*** Check the image's emulsion border for stickiness. Emulsions on nitrate that has reached stage 2 of deterioration or higher may be sticky or softened. (See B.13 for a review of nitrate deterioration stages.)
- ***Emulsion mirroring or silvering out:*** Both nitrate and acetate film turn mirror-like or look like tarnished silver—usually in the densest image areas. However, in nitrate the mirroring may appear as a black rainbow, while in acetate there is no rainbow-effect.
- ***Emulsion cockling and buckling:*** As it deteriorates, nitrate shrinks. This shrinkage causes the negative emulsion to buckle and lift-off the cellulose nitrate base. Early safety film (acetate, diacetate, and triacetate) also has an emulsion shrinkage problem that causes the emulsion to separate from the base and form long web-like channels. Channelized film, in which the emulsion lifts off the base to form raised honeycomb-like cells or tunnels, is **always** cellulose ester.
- ***Film gauge:*** Though motion picture film has come in a wide variety of gauges, nitrate was not available in all of them:
 - standard 8mm (never made in nitrate)
 - super 8mm (never made in nitrate)
 - 16mm (never made in nitrate)
 - 35mm (the most common nitrate gauge)
 - 70mm (less common nitrate gauge than 35mm)

Use the internal evidence indicators above with care, as they may be inconclusive. You may need to test the material to determine if it is nitrate

6. How do I determine whether film is nitrate, cellulose ester (acetate, diacetate, triacetate) or polyester?

You can use any of four tests to determine the composition of photographic negatives, transparencies, or motion picture film in your collection:

- *The polarization test* identifies polyester film.

- *The burn test* identifies nitrate film.
- *The float test* identifies all film types.
- *The diphenylamine test* identifies nitrate film.

Before using these tests, attempt to identify the nitrate by one of the techniques described in Section B.4 above. Or, use the polarization test (see Section B.7) in conjunction with the techniques described in B.4. While each of the four film tests has particular advantages and disadvantages as described below, **only the polarization test is non-destructive**. Therefore, the polarization test is the preferred test for use with NPS museum collections. Don't try to undertake the destructive tests (burn test, float test, or diphenylamine test) without training and appropriate facilities, such as fume hoods or an acid/organic vapor cartridge breathing apparatus that has been fitted to the user.

7. How do I use the polarization test?

The polarization tests can help you determine if film is made out of polyester. Place the film to be tested between two photographic polarizing filters or two pairs of polarized sunglasses. Twist or "cross" the filters or glasses so that they allow light to pass through them. Project a strong light through the pair of "crossed" polarized filters (or polarized sunglasses) and film. If the film is polyester-based, the shimmering full spectrum of rainbow-like patches will appear on the film. If the film is one of the cellulose esters or nitrate, you will simply see dimmed light, but no rainbows. As the only non-consumptive film test, **the polarization test is preferred over the other testing options**.

8. How do I use the burn test?

You can distinguish nitrate from safety film through the use of the burn test (a consumptive test). Cut a small snippet of film from the border (not the image area) of a negative or motion picture film. **Use a fume hood if one is available or an acid/organic vapor cartridge breathing apparatus that has been fitted to the user.** If you have no fume hood or apparatus, go outside of the building, far from any venting nitrate fumes, gasoline, or other flammable materials. Hold the film carefully by the corner using a hemostat or pair of long-handled tweezers.

Light the film snippet using a match.

- *Nitrate film* will burn brightly and consistently with an intense white-to-yellow flame. Fire should consume the nitrate snippet completely. Some nitrate film will have a camphor-like odor as it burns, although formulations varied during creation.
- *Safety film* will smolder and go out when the match is removed, leaving a melting or dripping mess behind and an acetic acid, vinegar-like odor.

You will need experience before you can use this test as a conclusive measure. On your first few attempts, work with film that has already been identified in order to experience the testing characteristics of both film types.

9. How do I use the float test?

Another way to distinguish nitrate from safety film is the float or trichloroethylene test (a consumptive test). Trichloroethylene is a dangerous volatile chemical and a known carcinogen, so avoid touching the trichloroethylene or breathing in the chemical's vapors. **When working with trichloroethylene use a fume hood and wear neoprene gloves** or work outdoors using an acid/organic vapor rated cartridge in a rated breathing apparatus fitted to the user and neoprene gloves. Never carry this open chemical through your storage, work, or reference areas.

Take a 6 mm x 6 mm chip (snip) of film to be identified from a film border. **Be sure to cut only the non-image area.** Place the film chip in a beaker or test tube of trichloroethylene. Place a lid on the beaker and shake it or press the film chip down into the fluid until it is thoroughly wet. The film will either float, sink to the middle of the beaker, or sink to the bottom of the beaker.

- Cellulose ester (cellulose acetate, diacetate, and triacetate) safety films float at the top of the beaker.
- Polyester film floats at the middle of the beaker.
- Nitrate film sinks to the bottom of the beaker.

After the test you must work with your hazardous waste coordinator to store and/or dispose of the trichloroethylene and the test strips according to EPA guidelines.

10. How do I use the diphenylamine test?

Perform the diphenylamine test (a consumptive test) very carefully as the solution contains about 90% sulfuric acid. Obtain a solution of diphenylamine and sulfuric acid, as described in the Canadian Conservation Institute's "The diphenylamine spot test for cellulose nitrate in museum objects," *CCl Notes* (17/2). Place a small film chip (from a border or non-image area) on a microscope slide and add a drop of the prepared diphenylamine solution. After 60 seconds, if the film is nitrate, it will turn a deep blue. Both cellulose ester and polyester films will either remain clear or turn a very pale blue, not a vibrant, deep blue.

To confirm the test result, apply two additional drops of the solution to the film chip and wait another minute for the film to turn deep blue. Conduct this test under a fume hood or outdoors wearing an acid/organic-vapor rated cartridge in a rated breathing apparatus fitted to the user, as **the sulfuric acid may irritate your mucous membranes.**

11. What determines the speed of nitrate deterioration?

Nitrate begins self-destruction at the moment of creation. **Nitrate film self-destructs at an unpredictable rate.** The only way to estimate when nitrate will be unusable is to have a conservator conduct the consumptive tests listed in Section B.14 on each individual sheet or roll of film—hardly a practical alternative. Several factors cause chemical or mechanical deterioration of nitrate, including:

- **Manufacturing and processing history:** During the early days of mass photographic processing each batch of photographic film had a slightly different composition. Factors affecting the life of the image include:

- the nitrate composition
- the nitrate thickness
- the emulsion quality

Residual processing chemicals, such as sodium thiosulfate and silver complexes, affect the life of the image but seem to have little to do with the actual life of the nitrate base. You may test for residual processing chemicals (particularly thiosulphate) in a variety of ways, ranging from using test strips to hiring a lab to conduct chemical tests, such as the methylene blue test. See Sections B.15 and C.15.

- ***Storage and housing environment:*** The storage and housing environment involves a wide range of factors that may affect the rate of deterioration, including:

- air contamination and pollution
- housing envelopes, sleeves, folders, and boxes
- insects
- light
- mold
- relative humidity
- rodents
- storage equipment
- temperature
- ventilation
- water

See Sections C.11 and C.12 for information on how to house and acclimatize nitrate and cellulose ester films.

- ***Handling:*** Abusive handling can cause scratches and abrasion, while direct hand contact can deposit oils, which ultimately lead to emulsion staining. Avoid using nitrate frequently for duplication purposes as this places great stress on a negative. Never project nitrate. Reformat frequently used materials to provide access, duplication, and archival preservation master copies. See COG 19/10, “Reformatting for Preservation and Access: Prioritizing Materials for Duplication,” for further help in determining what nitrate to reformat first.

12. Is nitrate deterioration predictable?

No. Although nitrate does go through five sequential stages of deterioration, without sophisticated chemical testing by a professional, it is impossible to predict how long the negative will exist in each stage. Film that has lasted for 60 years at stage 1 (relatively good condition) may go through stages 2-3 in only a few months, depending upon how the nitrate is stored and handled. Cold storage and regular inspection of nitrate is essential if collections are to be preserved.

13. What are the stages of nitrate deterioration?

There are five stages of nitrate deterioration.

- **Stage 1:** Film base discolors to a light amber tone.
 - Image fades.
 - A faint acidic or nitric acid smell may be detectable.
 - Image may stain, totally or in part, or exhibit “mirroring,” where it becomes dark and reflective.
 - A black, rainbow-like iridescence may be visible, not unlike an oil slick.
- (Note: Even the best preserved nitrate is now at least in stage 1 deterioration.)
- **Stage 2:**
 - Emulsion may soften.
 - Negative may become sticky, attaching itself to paper sleeves or other film.
 - Film base may become brittle.
 - Film base amber color may deepen.
 - A slightly stronger acidic or nitric acid smell may be apparent.
- Note:** In many cases stage 2 is the last stage at which nitrate can be copied or reformatted.
- **Stage 3:**
 - Emulsion may begin to separate from the base.
 - Nitric gas bubbles appear between the film base and the emulsion (image-bearing layer).
 - Film base is very brittle and deep amber in color.

- Significant “mirroring out” or mirror-like, reflective black staining is apparent, often with a rainbow-like appearance.
 - Nitric acid smell is strong.
- ***Stage 4:***
 - Emulsion begins to flow.
 - Sticky froth appears on the negatives.
 - Film sticks to nearby housing or negatives.
 - Image surface is easily damaged.
 - Nitric acid smell intensifies.

(Note: Film in this deterioration stage should be disposed of as hazardous waste. See C.16 and C.17.)

- ***Stage 5:***
 - Emulsion turns into an acrid brownish or tannish powder that is highly acidic.
 - Film shatters or breaks easily, as the nitrate base is **very brittle**.
 - Film can self-combust if stored near high temperatures or sparks.
Note: This is a rare condition in still negatives except for those of the largest sizes housed without sleeves.

(Note: Film in this deterioration stage should be disposed of as hazardous waste. See C.16 and C.17.)

14. *What chemical tests can be used to predict whether nitrate life has been exceeded?*

Two chemical tests can indicate whether nitrate should be immediately destroyed or not. These tests are:

- the Alizarin red heat test
- the Micro-crucible test

Don't attempt to do these tests yourself without a sophisticated chemical laboratory and excellent training. Send film to be tested to an outside chemical laboratory, which will provide you with the results and a recommended date for retesting.

15. *What tests can be used to predict the life of cellulose ester films?*

The Image Permanence Institute developed A-D test strips® for use in determining the level of cellulose ester film deterioration. Similar to pH test materials, the strips indicate the level of degradation in individual films. Use the strips to determine if storage conditions are adequate and to help you set reformatting priorities. The strips are available from the Image Permanence Institute (one package contains 250 detector strips about 1 1/2" x 3/8", a

color-reference pencil, and instructions), Rochester Institute of Technology, 70 Lomb Memorial Drive, Rochester, NY 14623-5604; Tel: 716-475-5199; Fax: 716-475-7230.

Place an individual strip in the container of the film to be tested (within a motion picture can, bag, box, sleeve, or cabinet). **Note:** Wear neoprene gloves to do this if you are working with deteriorated film. You may wear latex or cotton gloves if the film is undeteriorated. After exposure, the test strip color is compared to the reference pencil, which is printed with four bands of color, numbered from 0 to 3. The four bands of color correspond to the four levels of acidity. The reading indicates the extent of deterioration. **Note:** A-D test strips® are not useful indicators for polyester film deterioration. Some organizations, including the National Archives, however, are using them for indicating deterioration in both cellulose ester films (acetate, diacetate, and triacetate) and nitrate.

16. How do I ensure the long life of cellulose ester films?

Long life of cellulose ester film depends upon cool temperature, controlled relative humidity, a well-ventilated storage space, and good housing, as well as appropriate handling. The film age and type (acetate, diacetate, or triacetate) doesn't determine the speed of deterioration, though the original manufacturing, processing, storage, and handling history does affect the film life. Lowering the temperature to 2°F (-18°C) can extend by 200 times the life expectancy (LE) of film stored at 80°F. At 70°F the LE is approximately 100 years from the date of manufacture. Lowering relative humidity to 20% from 50% or higher can triple or quadruple the film LE.

The *IPI Storage Guide for Acetate Film* created by the University of Rochester's Image Permanence Institute can be used to predict life of acetate film at specific temperatures and relative humidities. Separate all nitrate and cellulose ester films from each other, from other film types, and from all deteriorated films of any kind. House these films in cold storage within the cold storage system configuration described in Sections C.11 and C.12. Place cellulose ester films in a cool, dry, well-ventilated space (ideally 0°F, 30% RH) housed separately from all other materials and office spaces to slow deterioration byproduct build-up. Use copies for reference and access. Access the originals only when a new set of interpositives and copy negatives must be produced. If cold storage is not possible, house the materials off-site in cold storage. See Sections C.3, C.11, and C.12 for further guidance.

17. Where can I get help on these issues of nitrate and cellulose ester identification and deterioration analysis?

You can get help from SO and regional staff, Harpers Ferry Center (HFC) Division of Conservation staff, and from colleagues at your state university and state and local archives and libraries, as well as from contract archivists and curators.

C. Management of Nitrate and Cellulose Ester Films

1. Do I have to keep nitrate film?

Yes. You must keep nitrate film at stages 1 and 2 of deterioration (Section B.13) that has high artifactual, evidential, and/or associational value. Keep any nitrate film, regardless of value, if it has not yet deteriorated to stage 3 or beyond and has not been reproduced, inspected, and the reproduction approved. If you are uncertain about the value of film, keep it until an

archivist can determine whether it has high artifactual, associational, or evidential value.

You may dispose of:

- *film with little or no artifactual, associational, or evidential value* as long as it has been reformatted and the copies have passed inspection
- *film of informational or administrative value* after high quality copies have been made that clearly reproduce **all** the information in the original and have passed inspection (If you are uncertain if all the information is conveyed in the copy, keep the original until an expert can check the film and copies to determine if the copies pass inspection.)
- *all film in stages 3-5 of deterioration* after you deaccession it, regardless of its original value

Work with your hazardous materials coordinator to dispose of badly deteriorated nitrate as hazardous materials according to the Environmental Protection Agency (EPA) Waste Codes and guidance. Don't attempt to do this by yourself. If your park has no hazardous materials coordinator, talk to your SO or regional curator or work with your local fire department to arrange a multi-park or regional disposition effort.

The only nitrate you must keep permanently after producing high quality copies that have been inspected is nitrate in deterioration stages 1 and 2 that has high artifactual or associational value and material of continuing evidential value. If you are inexperienced in judging value, keep all stage 1 and 2 nitrate film and make immediate arrangements for an experienced archival appraiser to determine whether to keep the originals.

See COG 14/8, "Caring for Cellulose Nitrate Film"; 19/10, "Reformatting for Preservation and Access: Prioritizing Materials for Duplication"; 19/12, "Contracting for Reformatting of Photographs"; and 19/13, "Preservation Reformatting: Inspection of Copy Photographs"; and Sections A.6, B.6, B.11, B.13, and B.14 for further guidance. Also see *Museum Handbook, Part II (MH-II)*, Chapter 6: Deaccessioning, for guidance.

2. *Do I have to keep other deteriorating film types, such as cellulose acetate, diacetate, and triacetate?*

No. Deal with other deteriorating film types as you would nitrate, although cellulose ester films don't pose such major safety hazards, as they are **not** a fire risk. Some individuals are sensitive to the acetic acid given off by the cellulose ester films. If health or safety issues become a factor, such as those caused by badly deteriorated collections, mold, insect or vermin infestation, or a chemical spill, follow the nitrate guidance.

Keep all original materials of high artifactual, associational, and evidential value in cold storage. Reformat and inspect your deteriorating items **before** they can no longer be used. After deaccessioning contaminated items, work with a NPS hazardous waste coordinator to dispose of them according to EPA guidelines. See Sections A.6, C.14, C.16, and C.17.

3. *What special storage requirements must my facility meet?*

Don't store nitrate, acetate, diacetate, or triacetate in:

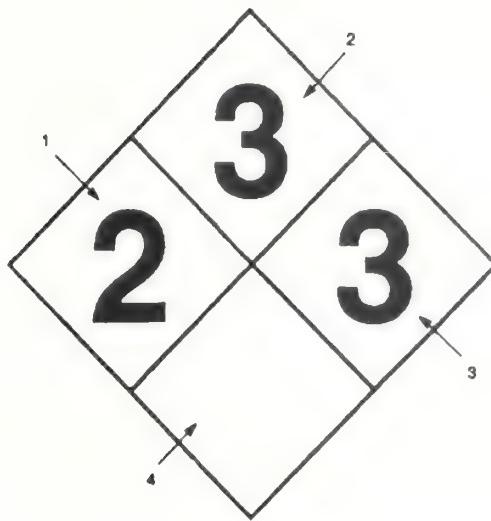
- office spaces
- attics
- general museum storage spaces
- historic buildings
- near windows or doors
- near light or heat sources
- in spaces with poor ventilation
- in spaces with no air conditioning
- in spaces without deluge sprinkler systems

For short-term storage of five years or less, house the collections as described in Section C.12, then place them in frost-free food freezers. This is **not** a recommended long-term solution because the deterioration byproducts may eventually build up in the freezer or refrigerator, causing health and safety hazards.

For long-term storage of more than five years, apply the National Fire Protection Association (NFPA) standards, particularly *NFPA 40, Storage and Handling of Cellulose Nitrate Motion Picture Film*, to all cellulose ester and nitrate film formats. No separate NFPA standards currently exist for still photographic negatives. Parks should not plan to store nitrate film for the long term on park grounds.

NFPA 40 is a rigorous standard that will result in very high-quality cold storage vaults with excellent venting, environmental controls, and fire resistance. However, the cost of applying this standard exceeds \$30 a square foot. NFPA 40 standards for vaults include stringent requirements for ventilation, refrigeration, heating, air conditioning, fire resistance, fire suppression, and temperature readouts. The vault will also require constant monitoring, much electricity, and scrupulous management to ensure environmental stability. **Parks wishing to build a nitrate storage vault should not do so in or near historic structures or in the same building as visitor centers, staff offices, or collections.**

Label all nitrate storage areas and freezer vaults with the National Fire Protection Association (NFPA) Hazard Warning Symbol for nitrate shown in Figure M.1 below. Make sure that you notify all local fire stations of the presence and location of nitrate accumulations in your park. **Note:** If you are planning to store only cellulose ester films (which like nitrate should be housed in separate packaging and placed in containers separate from that of nitrate or polyester films), you simply need temperature, humidity, ventilation, and lighting control. See Sections C.11 and C.12 and COG 14/4, "Caring for Photographs: General Guidelines."



- 1 – Health Hazard (BLUE)
- 2 – Flammability Hazard (RED)
- 3 – Reactivity Hazard (YELLOW)
- 4 – Special Hazard (WHITE)

Figure M.1. National Fire Protection Agency Hazard Warning Sign for Cellulose Nitrate Film

4. *What other options do I have if I don't want to store film in my park?*

Consider the following options:

- **Rent a cold storage vault:** Hire a cold storage vault outside of the park, such as the Bowers or Iron Mountain facilities in Pennsylvania or Bonded Film Storage in Fort Leigh, New Jersey (201-944-3700) and W.R.S. in Pittsburgh, Pennsylvania (412-937-7700). Although these facilities don't meet the optimum requirements, they do offer improvement over standard office and museum storage.

Note: Henry Wilhelm states in *The Permanence and Care of Color Photographs*, on page 342, “At the time this book went to press in late 1992 . . . there was no commercially available humidity-controlled, low-temperature (0°F [-18°C] and 25% to 35% RH) film storage rental space available anywhere in the world.” For more current information on cold storage suppliers, equipment, enclosures, and facilities that rent cold storage space, see the list in *Tools of the Trade*.

- **Use a NPS facility:** Move your film to a NPS storage and collections management facility with monitored cold storage, such as the Western Archeological and Conservation Center in Tucson or the San Francisco Maritime Museum.
- **Cooperatively share a vault:** Share a cold storage vault with a state, federal, or local agency, such as your state archives or library or a local university.

- **Sublet cold storage space:** Sublet cold storage space in a vault owned by another organization.
 - **Ask for help:** Request cold storage space from the National Archives and Records Administration (NARA) or your Regional Archives Center, also operated by NARA.
5. *How should I manage nitrate that I must keep in the park on a short- or long-term basis?*
- When managing nitrate, do the following:
- **Know the law**, particularly EPA, state, and local ordinances about the keeping and destruction of nitrate. Read the various standards and recommendations in the bibliography.
 - **Talk to your local fire department and safety-related park staff.** Ensure that they know where the nitrate is located in the park and the quantities and condition of the nitrate. Label the nitrate storage areas clearly with the NFPA Hazard Warning Symbol for nitrate to facilitate effective fire fighting. See Figure M.1.
 - **Isolate and label the materials** in a safe, humidity-controlled venting cold storage facility (0°F [-18°C] and 30% RH) far from museum storage, work, exhibit, and office areas.
 - Your best option is to use separate storage packets (nitrate separated from cellulose ester) with the nitrate packets housed in a separate environmentally stable vented cold storage chamber (vault room) by itself that meets NFPA standards.
 - Your second best option is to use separate storage packets (nitrate separated from cellulose ester) in environmentally stable cold storage with the nitrate and cellulose ester in the same cold storage vault. This option is perfectly acceptable as long as the temperature and humidity are both controlled (0°F (-18°C) or cooler and 30% RH), there is some venting, and a back-up power source is available.
 - Your third option is to use separate storage packets (nitrate separated from cellulose ester) protected by Molecular Sieves (dispersed molecular traps that absorb gaseous residues) with the temperature and humidity at least somewhat controlled in food freezer-type cold storage as described in Sections C.11 and C.12. Deteriorating materials should be duplicated and removed ASAP. This option is acceptable as long as the temperature and humidity are controlled and there is a back-up power source.
 - Your fourth and least desirable option is to use separate storage packets (nitrate separated from cellulose ester) protected by Molecular Sieve materials in standard museum storage. Use this only for short periods as film materials are prepared for duplication prior to cold storage.

Standard food freezers or refrigerators, whether frost-free or not, do NOT meet fire code standards because they are not vented, don't stop the build-up of toxic gases, and don't meet the need for a powerful deluge-type, wet-pipe fire extinguishing system. Such storage is NOT acceptable for permanent nitrate storage.

- **Duplicate materials** following American National Standards Institute standards and archival best practices. (See COG 19/11, "Preservation Reformatting: Selecting a Copy Technology," and 19/12, "Contracting for Reformatting of Photographs.") **Note:** Digital copies are not preservation copies. See Section C.14.
- **Inspect duplicates** of the original materials carefully for accuracy, completeness, and technical quality. (See COG 19/13, "Preservation Reformatting: Inspection of Copy Photographs.") Make new copies if any don't meet standards and reinspect. Repeat if necessary until high quality copies are achieved. See Section C.15.
- **Evaluate the remaining nitrate's condition.** If it is stage 3 or worse, work with a NPS hazardous waste coordinator to dispose of it according to EPA guidelines. See Section B.13 for a review of the stages. Keep materials with high artifactual, associational, and evidential value. (See Section A.6 and COG 19/10, "Reformatting for Preservation and Access: Prioritizing Materials for Duplication," for guidance.)
- **Deaccession and dispose of film** deteriorated to stage 3 or beyond, film with no relevance to the park's SOCS, and well-copied items with only informational/administrative value. Transfer them to another institution after deaccessioning if they have value or dispose of them. See Sections C.16 and C.17 and MH-I, Chapter 6: Deaccessioning, for guidance.
- **House materials with high artifactual, evidential, and associational values** in appropriate housing and storage containers in cold storage. See COG 14/6, "Caring for Photographs: Special Monochrome Processes," and Sections C.11 and C.12 below.
- **Manage the cold storage facility** carefully. Ensure that you have a back-up power source and a power outage alerting system in case of power failure. Inspect the contents every six months (see below). Check the cold storage facility weekly to ensure that there is no power outage or mechanical fault. Never store food or other materials in a film cold storage vault. Maintain monitoring records of the cold storage environment (temperature and RH).
- **Inspect a different 10% of all retained nitrate, acetate, diacetate, and triacetate every six months** for deterioration. Check RH indicator strips of materials in cold storage to identify punctured or torn bags requiring replacement and re-drying of their special humidity-controlling enclosures. See Sections C.11 and C.12 for details on how to house materials for cold storage. Replace all punctured bags and re-dry the special boards being used as humidity buffers. Check the contents of punctured bags or bags whose humidity indicators detect

humidity greater than 40% RH. Look for blemishes, silvering out, and other deterioration patterns described in Sections B.4 and B.13.

Remove negatives carefully from sleeves and look at them on a light table. To inspect motion picture film, unwind it slowly onto another reel with a smooth even pressure. If you find some seriously deteriorated items, arrange for their **immediate reformatting**, inspection, and disposal. **Note:** If more than 70% of the nitrate viewed during inspection is deteriorated, you should then inspect all of the remaining nitrate.

- *Move the nitrate, acetate, diacetate, and triacetate to a remote cold storage facility if the power in your cold storage facility should go off for more than 48 hours.* A nearby backup cold storage facility should be listed in your park's disaster and emergency operations plans. See COG 14/8, "Caring for Cellulose Nitrate Film."

6. *Should I isolate and handle cellulose acetate, diacetate, and triacetate in the same way?*

Yes. First reformat all acetate, diacetate, and triacetate film of value and inspect the copies. Place the undeteriorated originals that have high artifactual, evidential, and associational value in cold storage to slow deterioration and minimize the deterioration byproduct gases. Don't place these cellulose ester materials in the same cold storage chamber as nitrate unless the chamber is kept well ventilated and very, very cold (0°F [-18°C] or cooler and 30% RH).

House the film as described in C.11 and C.12. Don't place cellulose ester films in work spaces, museum storage, reference spaces, or office areas because they also give off acidic deterioration gas byproducts that may pose health hazards for some individuals. For more guidance, see the *IPI Storage Guide for Acetate Film* in the bibliography.

7. *What should I do when working with nitrate to avoid health hazards?*

First, isolate nitrate far from other collections, research rooms, and staff work and office spaces. When handling nitrate there are a number of routine precautions you should take:

- *Maintain a log* of who works with nitrate for health monitoring.
- *Stop working with nitrate immediately* if you experience any shortness of breath or eye or skin irritations.
- *Wear protective clothing*, including:
 - latex or cotton gloves for undeteriorated film; neoprene gloves for deteriorated film
 - a long-sleeved, washable smock
 - goggles, if working with deteriorated film
 - an acid/organic vapor-rated cartridge in a rated breathing apparatus fitted to the user

- *Wash regularly* all clothing, gloves, goggles, and work surfaces used for nitrate work; don't wear dirty or reused gloves
- *Don't wear contact lenses* when working with nitrate. Gases may build up under your lenses causing eye injury.
- *Limit your work with nitrate* to three hours per day.
- *Position a fan* so that the airflow blows fumes towards an air outtake valve or open window and away from you.
- *Never rub your skin, hair, or eyes* with a nitrate contaminated gloved hand.
- *Never inhale fumes* from nitrate or cellulose ester film.
- *Work in a cool space* far from any sources of heat, flames, or sparks.

8. *How do I avoid health hazards with cellulose ester films?*

Handle cellulose ester film as you would nitrate. Work only in a well-ventilated room to avoid breathing problems caused by acidic byproducts related to vinegar syndrome. (See Section B.3.) If the room lacks good ventilation, place a fan so it blows on you and position yourself in front of an air outtake register or open window, so the fumes are sucked away from you. Wear neoprene gloves if the film is deteriorated, or cotton or latex gloves if the film is in good condition. If the film is deteriorated and the ventilation is poor or you are sensitive to cellulose ester film, wear an acid/organic vapor-rated cartridge in a rated breathing apparatus fitted to the user. Don't wear contact lenses around cellulose ester film.

9. *How should I mark nitrate and cellulose ester films?*

Individual copy negatives and interpositives may be marked on their reverse edge (on the back in an area that is the reverse of the border of the image) with a photographic marking pen that has neutral pH carbon ink and has passed the Photographic Activity Test (PAT). The PAT is described in COG 14/2, "Storage Enclosures for Photographic Prints and Negatives." Consider using the Pigma Ink pen by Light Impressions for marking.

Remove all images before writing on an envelope or sleeve. Let image labeling dry thoroughly before re-inserting images in sleeves or envelopes. Generally mark only minimal information (the negative number or catalog number) in very small characters on the non-emulsion side in the non-image area. Never mark in the actual image area or on the reverse of the image. Label envelopes and sleeves on the seamed side, or if using a four-fold sleeve, label on the top of the fold area.

10. *What common factors affect the life expectancy of nitrate and cellulose ester films?*

Of all the factors affecting nitrate life, temperature, relative humidity, ventilation, handling, and housing systems and equipment are perhaps the most significant. Recent studies by Peter Adelstein and others indicate that the nitrate storage environment, particularly temperature and humidity, are crucial to safe handling and long nitrate life. For every 10°F decrease in storage temperature, the film life is almost doubled. Lowering relative humidity to the 40-60% range from the 70-80% range doubles the life of the film. For long-term storage, 20-30% RH is recommended.

11. What materials and systems should I use to house my nitrate and cellulose ester?

Use housing that meets the *American National Standards Institute (ANSI) Standard IT 9.2-1991, Photographic Processed Films, Plates, and Papers—Filing Enclosures and Storage Containers*, that is a high alpha-cellulose clamshell box made of acid-free materials with reinforced seams. Select high-alpha cellulose, four-fold paper sleeves that pass the photographic activity test. Transfer the label and caption information onto this folded side, and place the emulsion so it faces the non-fold side. Place the emulsion side of negatives away from the labeled side of the sleeve to avoid label loss if the film deteriorates. If you use a slide-in sleeve, treat the seamed side like a flap so that the emulsion is away from the seam on the unlabeled side. Use buffered sleeves for cellulose nitrate and for black-and-white cellulose ester film, but use unbuffered sleeves for all color film.

For long-term storage, place your rehoused collections in polyethylene bags or polypropylene film cans within drop-front storage boxes within a second layer of polyethylene bag inside a cold storage vault. Use zeolite materials (dispersed molecular traps that absorb gaseous residues) to protect your film from the buildup of acidic gas byproducts that hasten film destruction if the items are:

- particularly precious
- very large format (8" x 10" and larger) or in large quantity (more than 35 pounds)
- unable to be placed immediately in a cold storage vault
- in a vault with poor environmental controls

Zeolite materials include MicroChamber™ packaging or FPC® Molecular Sieve packets. The packets are placed inside each film container. The packaging is used just as acid-free packaging is normally used. Zeolite materials without cold storage don't by themselves provide adequate protection from deterioration. They simply capture gaseous byproducts that speed deterioration; they don't stop deterioration. Don't reuse zeolite or other housing materials or old containers of any sort. If a film can or box is deteriorated, replace it. Zeolite is an excellent storage material, but may be too expensive for many uses.

The use of the double-bag or Safecare®-type housing system (which includes polyethylene bags, humidity conditioned mat board, RH indicator strips, and boxes) for cold storage of film protects it from condensation, mechanical damage, and handling damage. *Note:* All of the materials found in the Safecare® system are currently found in the *Tools of the Trade*.

If you use venting, hazardous-material freezer(s) for long-term housing without zeolite housing or FPC® Molecular Sieve packets, keep nitrate and cellulose ester films in separate packages within the freezer(s) as described here and in C.12. When possible, also house and store deteriorated film separately from non-deteriorated film. Keep film freezers far from office, museum storage, work, or reference spaces (at least not in the same building and not in any historic structure). Ideally, all vaults and freezers should be checked for collection deterioration at least every six months.

The combination of the two systems--zeolites to control outgassing and Safecare®-type storage systems to control condensation, mechanical damage, and handling damage during cold storage--is ideal. This combination provides maximum protection although the cost may be excessive. Cold storage and the Safecare® system of polyethylene bags, board, and humidity indicator alone are an excellent and relatively inexpensive storage option. A third system is the use of heat or pressure seal bags constructed of layers of foil, paper, and plastic. These bags form an excellent moisture barrier but can't be easily reused after opening, nor are they transparent for examining the condition of the film. These sealed, multi-layered bags are also significantly more expensive than the polyethylene bags.

For long-term storage, house each type of material (deteriorated nitrate, undeteriorated nitrate, deteriorated cellulose ester films and undeteriorated cellulose ester films) separately in its own cold-storage package. Never mix deteriorated and undeteriorated materials or cellulose ester and nitrate materials in the same package. When housed in a cold, dry environment (0°F [-18°C], 30% RH), in dark storage, with low-levels of gaseous pollutants, and a good air circulation/ventilation system, nitrate negatives will endure.

Container selection is also important. Using acidic housing, tightly sealed housing, or no housing hastens nitrate destruction by allowing gas buildup in containers or storage spaces. Except when housed in cold storage or with zeolite materials, place nitrate in vented storage in order to allow the nitric oxide gases to escape. Even cold storage rooms should be explosion proof and vented without internal electrical components other than lighting and humidity/temperature gauges. See Section C.3 for information on short- and long-term storage.

12. How should I prepare my collections for cold storage?

Don't rehouse materials for cold storage until **immediately** before storing them. Long-term storage at room temperature in sealed containers or plastic envelopes or sleeves may be damaging. If a film can or box is deteriorated, replace the container. Don't reuse old containers. Ideally, select vented polypropylene cans for film. To implement this system place sleeved film (either buffered or zeolite materials) within cold storage kits configured like the Safecare® system, which works as follows:

- **Step 1:** Condition the film by storing it at 40% RH for several days to limit the possibility that condensation will form within the sealed bags when the bags are placed in the cold storage.
- **Step 2:** Rehouse the images in acid-free sleeves or envelopes or in vented polypropylene film cans. **Note:** If you have adequate funds, use zeolite sleeves for negatives and place FPC® Molecular Sieve packets in the boxes housing the film or film cans when you have either rapid deterioration or less than optimum environment controls or you have materials of exceptional artifactual value.
- **Step 3:** Place the sleeved or canned film within a polyethylene bag with a RH indicator strip, then gently press all the air out of the bag before sealing.

- *Step 4:* Oven-dry (200°F for 3-5 minutes) or microwave-dry (full power for 30 seconds, then turn and repeat) a pre-cut mat board; then allow it to cool.
- *Step 5:* Label a 13" x 10" x 1½" drop-front storage box with the collection name, catalog number, "hazardous nitrate," and any other useful information.
- *Step 6:* Place the cool oven-dried mat board in the bottom of the storage box. Don't overfill the box.
- *Step 7:* Check the bag seal to ensure it is tight and complete.
- *Step 8:* Place the bagged film on top of the mat board. Don't place more than one type of film (nitrate, deteriorated cellulose ester, undeteriorated cellulose ester) in a single box.
- *Step 9:* Place a second oven-dried mat board on top of the bag holding the film. Close the box lid.
- *Step 10:* Place the box inside the second polyethylene bag, add the second RH indicator strip, then press all the extra air out and seal it. Check the RH indicator strips every six months or so.

Sealed materials housed in cold storage in this way should be stable for up to 15 years before you must re-dry the mat board and replace the RH indicator strips. When you remove materials from cold storage, allow them three hours to acclimatize before unsealing. Acclimatize the materials by placing them on an open rack for even heat transfer **before opening the bag**. Wipe off any condensation from the outer bag before opening it.

If you rehouse the image in cold storage, oven dry the mat boards again before replacement. Check all polyethylene bags for holes prior to reuse. Replace all bags with poor seals or holes. Don't place packaged materials directly on the floor of the cold storage facility or on closed shelves directly under pipes. Label the freezer with the NFPA Hazard Warning Symbol for nitrate. See Figure M.1. If you use FPC® Molecular Sieve packets, house the film as described above, but use double polyethylene bags to contain the film storage can or negatives.

13. How should I clean dirty films?

Never try to clean film in stages 3-5 of nitrate deterioration or any film with a sticky, soft, flowing, flaking, or powdering emulsion. If you must clean cellulose ester or nitrate film, don't use water or solvents, but you may use compressed air or brush the film gently with a soft, clean, and wide camel's hair brush. If any damage is noted, stop immediately. Wash the brush regularly and allow it to dry thoroughly before resuming work. Ideally, use several brushes, so you won't have to wait for them to dry before resuming cleaning. Generally, clean only for duplication purposes.

Appendix N: Curatorial Care of Wooden Objects

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APPENDIX N: CURATORIAL CARE OF WOODEN OBJECTS

A. Overview

1. *What is covered in this appendix?*

This appendix deals primarily with the preventive conservation of wooden objects on exhibit and in storage. It discusses proper environmental conditions and details housekeeping procedures. In order to provide an understanding of how and why wooden objects react to the environment and to human intervention, the appendix includes:

- a discussion of the nature of wood
- typical fabrication techniques of wood objects, furniture, and associated materials
- types of deterioration that affect objects made of wood

2. *What types of wooden objects are found in museum collections?*

Park museum collections contain wooden objects in a wide range of forms:

- utilitarian objects, such as tools and farm vehicles
- religious objects, such as icons and altars
- furniture, significant for historical or decorative reasons

A large percentage of objects in NPS collections are composites—articles made of more than one type of material. Composite objects include:

- frames that house prints, documents, and paintings
- musical instruments
- rifles
- machinery, such as sewing machines and cameras

3. *How much care do wooden objects require?*

Both the nature of individual objects and how they are exhibited dictate how much and what kind of care is needed. Wooden objects are found under a wide range of exhibit and storage conditions.

- Furniture often is in open exhibits in furnished historic structures.
- Vehicles, totem poles, and gun carriages frequently are on exhibit outside, where they are exposed to the weather.
- Smaller objects may be more carefully exhibited in display cases in visitor centers and museums.

4. *Should I provide on-site care myself or contact a conservator?*

This appendix includes a discussion of how you can assess the condition of wooden objects and when to seek the advice of a conservator.

B. The Nature of Wood

To understand the behavior of wood and its requirements for long-term preservation, you should be aware of the physical and cellular structure of a tree. You will then know why wooden objects react to particular environmental conditions. Some wooden objects from prehistoric sites, such as tools from dry caves in the Southwestern United States, remain in excellent condition, while other wooden objects deteriorate rapidly. The condition of these objects depends on the type of environment in which they were housed.

1. *What is the structure of a tree?*

A tree can be described as a bundle of vessels, its walls composed of cellulose glued together with lignin. New cells grow around the circumference of the tree, forming a ring just within the bark. Wood cells are longer than they are wide and are oriented parallel to the long axis of the trunk and branches. The term *grain* in this appendix refers to the direction of the vessels. “Cross grain,” then, refers to the horizontal plane, while “along the grain” refers to the vertical plane.

Looking at the end of a log or a cross-section of a tree, you can see an inner and an outer zone. The outer zone called *sapwood* is lighter than the inner or *heartwood* zone. These two zones serve distinct functions in the living tree and have very different characteristics that influence the behavior of wood even after it has been fashioned into objects. Sapwood is composed of newer living cells, which transport sap or water to the leaves and which store nutrients. As sapwood ages and becomes heartwood, *extractives* form within the cell walls, giving it color, durability, and dimensional stability. The chemical defenses found in the extractives help protect heartwood lumber from biological attack. Lumber from sapwood has no such protection.

2. *What are the three planes common to trees and lumber?*

Lumber has three planes, which are illustrated in Figure N.1:

- cross section
- radial section
- tangential section

The surface exposed in a cross-section is referred to as *end grain*. Because the cell cavities are exposed in end grain, water is both easily absorbed and given off. The surface is hard and prone to splitting. It does not take stain or finish well and cannot be sanded smooth.

The radial plane extends along the long axis of the tree, more or less perpendicular to the growth rings. The grain pattern on this vertical or edge grain is usually straight and regular. Boards cut along this plane are dimensionally stable and distort very little in response to changes in ambient relative humidity. They will also stand up to abrasion and weathering.

The tangential plane extends along the long axis of the tree and forms a tangent with the concentric growth rings. Boards cut along this plane will swell, contract, and become distorted at twice the rate of those cut on a radial plane.

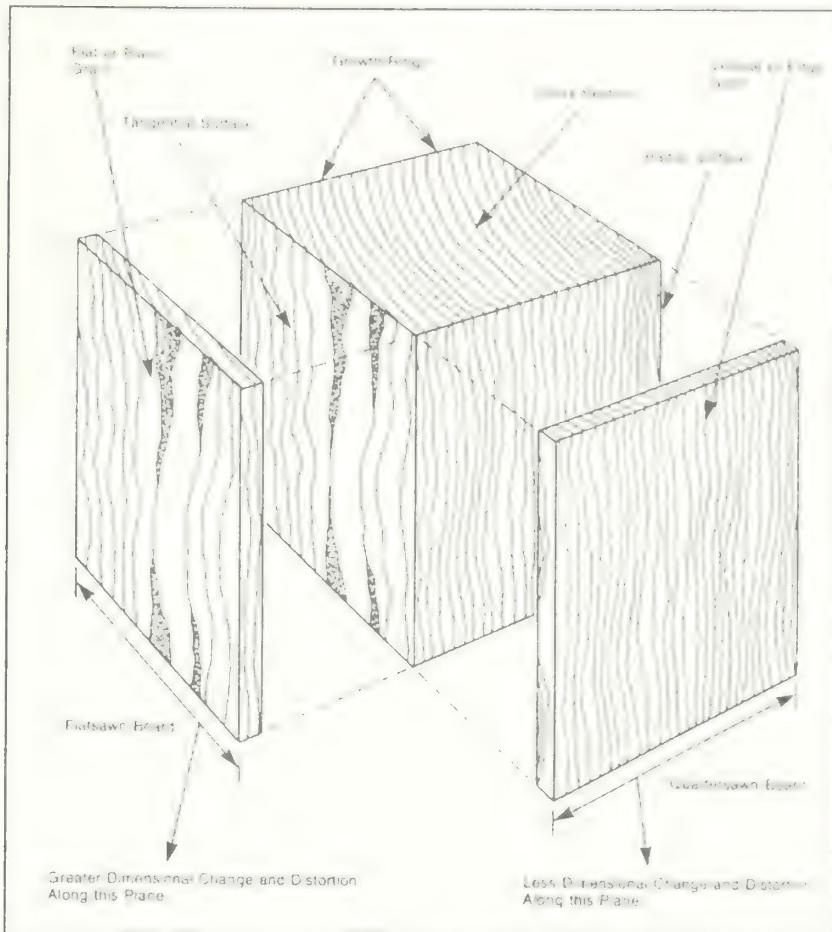


Figure N.1. The Three Principal Planes or Surfaces of a Typical Block of Wood: Tangential, Radial, and Cross Section

3. What effect does water have on wood?

There is a very strong molecular attraction between water and the cellulose in wood (called *hygroscopicity*). In freshly cut wood, water is found in both vessel cavities and cell walls. As the wood dries, the water in the cavities evaporates, but as long as the bound water remains in the walls, the wood will stay at the *fiber saturation point* and will not shrink. The moisture content at saturation is about 25%. When below this point, the wood will respond to changes in ambient relative humidity. Air-dried wood will reach a moisture content of 10%-12%, while kiln-dried wood will reach a moisture content of about 7%. This kiln-dried wood or the objects fashioned from it will absorb water vapor if placed in an environment with high relative humidity.

Wood will eventually arrive at equilibrium with its environment, neither absorbing moisture (swelling) nor giving off moisture (shrinking), as long as the RH remains constant. See Figure N.2 for a graph that illustrates the relationship between relative humidity and equilibrium moisture content in wood. This graph can help you calculate the amount of contraction or expansion that may occur in wooden objects.

When moisture is absorbed and released, the cell walls expand and contract. The cell length, however, remains nearly unchanged. Therefore,

dimensional change in wood is not uniform in all planes (see Figure N.1). While movement **along** the longitudinal plane (the long axis of the tree) is negligible (only about .1%), movement **across** this plane is significant. Along the tangential plane, dimensional change is the greatest, averaging about 8%. Along the radial plane, dimensional change averages about 4%.

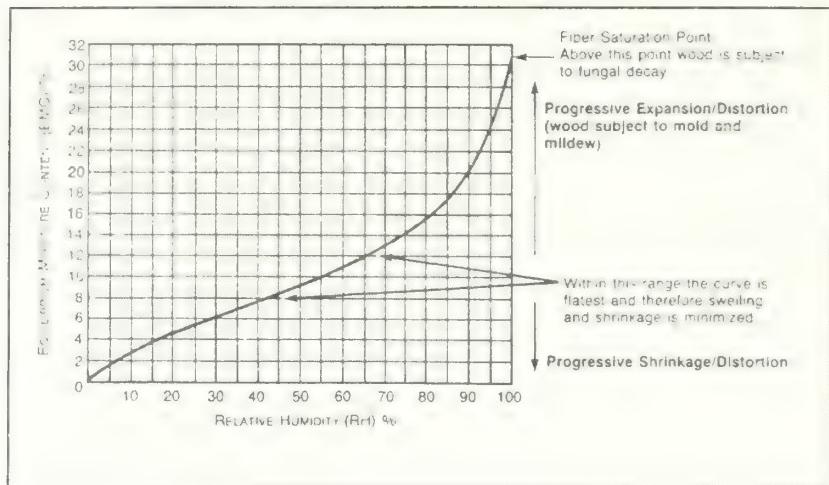


Figure N.2. Graph Illustrating the Relationship Between Relative Humidity and Equilibrium Moisture Content of Wood

4. *Do all types of wood react in the same way?*

No. The extent of dimensional change varies from species to species, making some kinds of woods more desirable in the making of furniture and wood objects. Teak, mahogany, and redwood are among the more stable woods. Walnut and cherry, popular woods with furniture makers, fall in the middle of the range.

5. *Where is the difference in dimensional change evident in museum objects?*

The rim of a turned bowl over time will move out of round, becoming slightly oval in shape because of the difference between tangential and radial shrinkage. For the same reason, turned feet become oval, and square legs take on a diamond shape on many pieces of furniture. Rungs and stretchers may become loose in chair legs because of the differential in shrinkage along and across the grain. Veneered surfaces may split or buckle because the grain orientation of the veneer is different from that of the underlying wood.

C. Agents of Deterioration

Wood decays both in nature and in museums as a result of:

- physical deterioration
- chemical deterioration
- biological deterioration

1. *What's involved in physical deterioration?*

There are three direct causes of physical deterioration.

- changes in relative humidity
- weathering
- human abuse

2. *How do changes in relative humidity cause physical deterioration?*

Shrinking and swelling, caused by changes in relative humidity, have been addressed in the discussion of the nature of wood. Because this reaction is not uniform across all planes, boards may become distorted or warped. The type of distortion will usually depend on the shape of the board and the orientation of the wood cells. See Figure N.3 for an illustration of characteristic shrinkage and distortion.

- *Cupping* is a deformation across the width of a board. It is often observed on wide, unrestrained boards, such as leaves on a drop-leaf table. This cupping can occur in the initial seasoning or later on in the life of an object. It can sometimes be caused by applying finish to only one side of the board. It may also occur when different microclimates are present on opposite surfaces. For example, the surface of a table leaf in the sun or near a radiator will become dryer than the surface underneath.
- *Checking* is also a result of uneven shrinkage. Stress can cause cells along the grain to separate, usually at the end grain or near the surface. Checking usually occurs during the initial seasoning, however, it can also occur if the relative humidity drops rapidly. Checks may extend just a short distance, causing only visual damage to the object, or they may extend an inch or more into the board causing actual structural damage.
- *Radial cracking* almost always occurs in logs that are left to dry. A pie-shaped crack will open from pith to bark edge to relieve the stress caused by the differential in shrinkage between the radial and tangential planes. Wood used in making objects that require a wide cross section, such as large bowls and three-dimensional sculpture, must be dried very slowly and carefully. Even with this precaution, the objects will always be prone to radial cracking.
- *Diamonding* is caused by the difference between tangential and radial shrinkage. A piece of lumber originally square (or rectangular) in cross section will become diamond-shaped.

A straight-grained, unrestrained board can usually withstand moderate fluctuations in relative humidity without damage. Because furniture is often made from various members that are connected across grain and are restrained from natural expansion and contraction by glue and nails or screws, the stress can become strong enough to cause the wood to split.

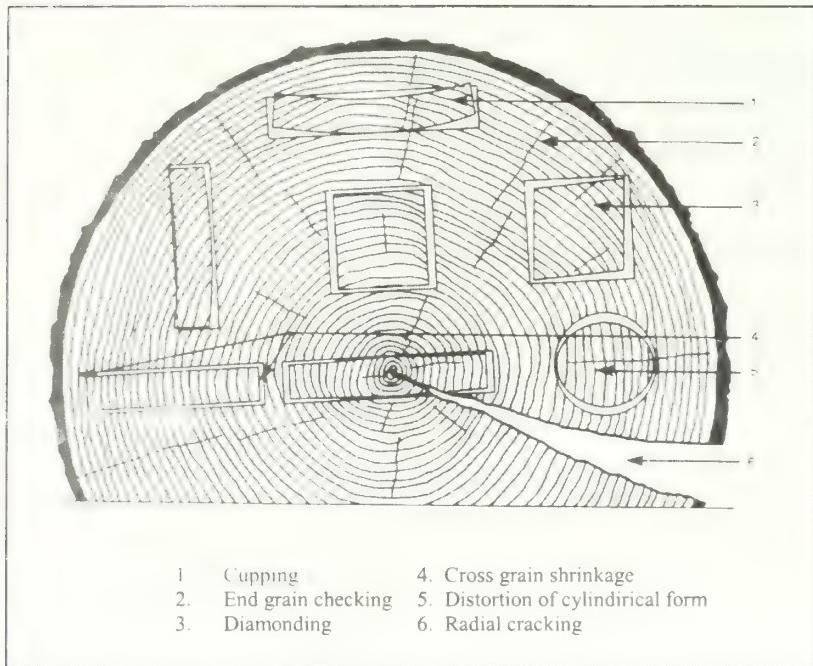


Figure N.3. Characteristic Shrinkage and Distortion of Wood (Viewed from the Transverse Plane)

3. *What effect does weathering have on wooden objects?*

Wooden objects housed outdoors are subject to physical erosion from the action of rain and wind-driven particulates, though that erosion generally does not exceed $\frac{1}{4}$ inch of unprotected wood surface per 100 years. The weathering process also includes photochemical degradation. The wood surface generally takes on a silver-gray color and a striated texture as the softer earlywood wears away and the harder latewood is exposed. Ultraviolet light breaks down the lignin in the cell walls, which is then washed away by the rain. The silver-gray surface, which is only a few millimeters thick, is actually more resistant to biological attack than non-weathered surfaces.

Many wooden objects now in indoor museum collections spent their useful life outdoors. As long as the objects are free of fungal and insect damage, the weathered condition can be considered stable and the appearance should be preserved as part of the historical evidence.

4. *What types of deterioration are attributed to human abuse?*

Physical damage to wood objects in museum collections can result from improper handling and housekeeping procedures, and poor storage or exhibit conditions. Physical damage will occur more often in collections exhibited in furnished historic structures where the objects are exposed to more soils and dust in the environment and therefore require more frequent cleaning.

Poorly done repairs are another common cause of damage to wooden objects. Nails may split the wood and mar the surface; glue may leave misaligned surfaces and residue; original finishes may be removed mistakenly. Future conservation treatment may be made more difficult by the use of irreversible materials.

5. *What are the agents of chemical deterioration?*

There are five basic agents of chemical deterioration:

- **Light** causes deterioration of the cellular structure of wood, breaks down the lignin component, and bleaches its colors. The most harmful component of light is ultraviolet (UV) radiation. Light damage to wooden objects in furnished historic structures is most commonly caused by sunlight streaming through unshaded windows. It can also occur from excessive artificial light used to illuminate exhibits. Not only is light harmful, but the heat it generates also does damage, especially when lighting fixtures are placed inside exhibit cases.
- **Acids** may deteriorate the cellulose in wood causing it to become brittle. Acid rain on outdoor objects can be a problem.
- **Alkalies or bases** degrade the hemicellulose and lignin component of wood and cause the wood to separate into individual fibers. Alkaline solutions are more damaging, as a rule, than acidic solutions.
- **Salts** can also result in defibration of the wood tissue, but exposure to salt is less common. It may be seen in wooden objects used in food preparation and in objects exposed to a maritime environment.
- **Fire** is the most dramatic and by far the most damaging form of chemical deterioration. Wood is a readily flammable material.

6. *What are the biological agents of deterioration?*

Wood is subject to deterioration from a number of biological agents. Damage to wooden museum objects often occurs before the object is placed in the museum setting and may happen even before the wood is sawn into lumber.

- **Bacteria**, which consumes the starches stored in ray cells, generally affects only water-saturated wood and is therefore not a problem in most museum collections. However, wood that has been made more permeable by bacteria previously can be vulnerable to fungal activity.

- **Fungi** cause more biodeterioration in wood than any other agent. Because fungi have no chlorophyll, they must live on other organic material. The plant consists of thin, thread-like material called *hyphae* that mat together to form *mycelium*. Fungi produce large numbers of spores. Three types of fungi affect wood:

- *Mold fungi* live principally on the surface of wood and discolor it. However, they don't consume cellulose and therefore don't weaken the wood.

Stain fungi invade the cell structure of sapwood and live on stored carbohydrates.

Decay fungi actually consume the cellular structure of wood, totally destroying it in some cases. These fungi produce enzymes that break down the cells. The two major types of decay-causing fungi are brown rot and white rot. Brown rot consumes cellulose, leaving a brown color and checking both along and across the grain. White rot consumes both cellulose and lignin, causing the

wood to lose color and crack along the grain. Decay fungi, consequently, cause abnormal shrinkage of wood tissue.

Fungal spores are found in virtually every environment. In order to germinate, however, they require air, heat, moisture, and nutrients. By controlling these conditions you can prevent fungal growth on wooden objects in your collection. Ideally, relative humidity should be kept between 45% and 55%. RH must never exceed 65%.

Temperatures high or low enough to effectively stop fungal growth are impractical in a museum. However, maintaining a temperature of 68° F or below will retard the growth of mold. Decay fungi are problems only when the moisture content is at or above the fiber saturation point. The wooden object would have to be in contact with water to reach a moisture content over 30%. See *Conserve O Gram 3/4, Mold and Mildew: Prevention of Microorganism Growth in Museum Collections*, and Chapter 4: Museum Collections Environment.

- **Insects** both feed on wood and excavate it to shelter themselves. See Chapter 5: Biological Infestations, for a lengthier description of wood pests and instruction in integrated pest management.
 - *Beetles* do the most damage to furniture and wooden objects, particularly in temperate climates and an environment of high relative humidity. The adult lays its eggs in pores or checks in the wood surface. After the eggs hatch, the larvae excavate tunnels through the interior of the wood, eventually pupate, and then bore holes to the surface to fly off. The larval stage may last up to 10 years.
 - *Termites*, though less of a problem than beetles, can do considerable damage to stationary structures. Drywood termites, found primarily along the southern and southwest coasts of the U.S., do not need moisture and feed on the dry wood they infest.
 - *Carpenter ants* do not eat wood, but excavate large chambers for their colony.
 - *Carpenter bees* bore large chambers and use them for their eggs, but do not actually consume the wood.
- **Marine organisms** are a significant problem in wooden ships and other underwater artifacts. *Shipworm* and *gribble* are two of the most destructive marine organisms. Shipworm is a mollusc that lives on wood and plankton and makes channels in the wood up to 2.5 cm in diameter. Gribble is a small crustacean, barely 1/8" long, that tunnels narrow channels close to the surface of the wood.
- **Rodents** damage wood by their gnawing to get food and salts from the surface of wood or to get through to the food stored within. Museum furniture, such as pie safes and jelly cupboards, may have large holes through their backboards. Wooden food vessels that may contain food remnants on the surface or in the pores are vulnerable to rodent damage. Removing the food, however, also removes important evidence of historical or cultural use.

- **Birds**, mainly woodpeckers, are a threat to outdoor wooden objects. They are drawn to wood that may have insect infestations.

D. The Nature of Furniture

Most furniture originally served both functional and decorative purposes. Once in a museum collection, furniture no longer needs to be functional. The conservator and curator, therefore, focus on preserving the decorative and historical aspects of the piece. A single piece of furniture may be formed from several components, each requiring special knowledge and treatment. These components may include joinery, metal fasteners, adhesives, veneer, finishes, hardware, and upholstery.

1. What are the common types of joinery?

Almost all furniture is made from two or more pieces of wood, joined together in some fashion.

- The **mortise and tenon** joint is one of the most common and earliest joints used in furniture construction. The mortise is a hole chiseled into a piece of wood, while the tenon is the projection on the end of another piece of wood that fits into the mortise. Because these two pieces of wood are at cross grain to one another, different degrees of expansion and contraction can cause problems. The tenon should be slightly smaller than the mortise to prevent the mortise from splitting. These joints are typically held together with glue, though in country pieces, it was common to drive square pegs into round holes drilled through the joint. See Figure N.4 for an illustration of a typical mortise and tenon joint.
- **Frame and panel construction** prevents the splitting that often results when wide boards are constrained at their edges. In this technique the frame is made from relatively narrow boards joined at the corners with mortise and tenon. The inner edge of the frame is grooved to hold the edges of a wide panel, which is free floating and therefore able to expand and contract freely with changing relative humidity.
- The **dovetail joint** is another traditional technique, generally used to join the edges of wide boards. The edges are cut and chiseled so that they interlock. This technique was typically used on the sides of drawers and chests. Dovetail joints are commonly glued. See Figure N.5 for an illustration.

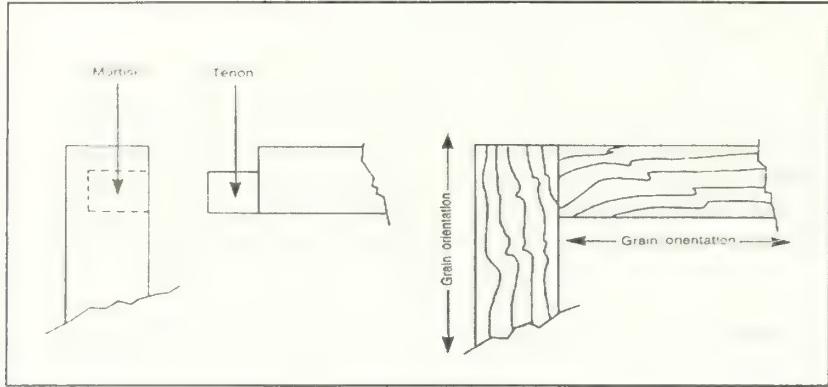


Figure N.4. Typical Mortise and Tenon Joint

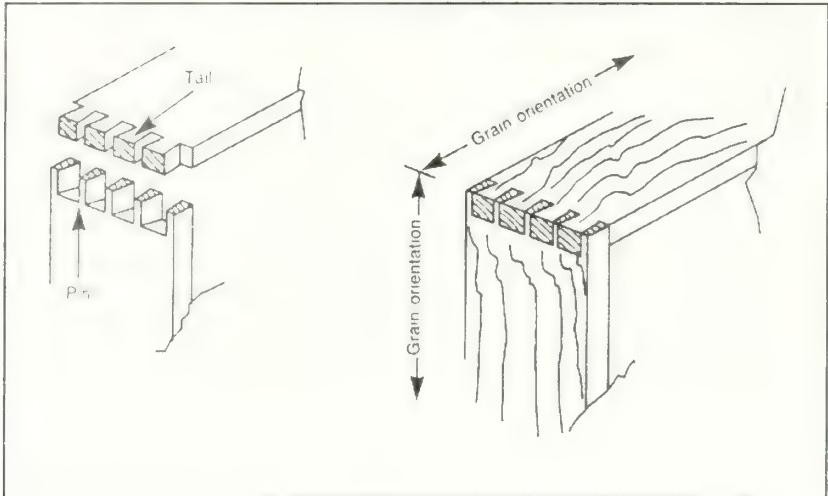


Figure N.5. Typical Dovetail Joint

2. *What should I know about metal fasteners?*

Various types of metal fasteners have been used in furniture construction, including nails, screws, and bolts. Hardware can be useful in dating furniture. For example, nails became more frequently used when they were first mass-produced in the late 1700s. Screws were not commonly used until the 1840s, when the technology to manufacture them with gimlet points was developed. (A gimlet point is one that can readily penetrate wood.)

Fasteners are most often made from ferrous metals, which corrode in high relative humidity. This corrosion can spread, damaging the appearance and structure of the wooden object. Severely corroded metal will expand, crushing and splitting the surrounding wood. *Corrosion jacking* is most likely to occur at the coast, where there is exposure to salts in the environment. Iron salts, often present at contact points between wood and ferrous metals, degrade and discolor wood. Woods with high tannic acid levels, such as oak, are very susceptible to damage from iron salts. Contact between some woods and metals also will accelerate the oxidation of the metal.

3. What types of adhesives are used in creating wooden furniture and other objects?

Adhesives, used alone or in conjunction with fasteners, come in three basic types:

- **Protein-based glues**

Animal products are the primary ingredients in protein-based glues. Historically, the two most commonly used varieties were hide glue and fish glue. These were heated to a gel before use. The glue set as it cooled and the water content evaporated. Because this type of glue is readily resoluble and has a long setting time, it is often used in the conservation treatment of furniture and other wood objects.

Though strong in a proper environment, protein-based glues are water-soluble and therefore fail in high relative humidity. At the other extreme, very low relative humidity, the glue will dry and crack causing the joint to fail. Casein glue, made from milk curds, is occasionally found in furniture and wood objects. It is more resistant to the effects of moisture than the other protein glues. Another disadvantage of these substances is the attraction they hold for insects.

- **Vegetable glue**

Vegetable glues, such as starch paste, though seldom used for gluing wood joints, can be found adhering paper labels or paper coverings to wooden surfaces. Other types of vegetable glues, like gums and resins produced by trees, are commonly found on ethnographic wooden objects, but not in Western furniture. Like hide and fish glues, vegetable glues are sensitive to changes in relative humidity and are susceptible to biodeterioration.

- **Synthetic resins**

Synthetic resin adhesives have become increasingly common since the 1940s. They harden either through the evaporation of a solvent, like water, or a chemical reaction between a hardener and a resin. Many post World War II objects in museum collections are constructed with these adhesives. Most synthetic resins form a very strong bond, are durable, and are relatively insensitive to environmental conditions. These qualities become disadvantages when objects need conservation treatment for it is nearly impossible to separate these joints without causing damage to the wood surface.

4. What is veneer and what are the problems associated with it?

Veneer is a thin layer of wood glued to a solid base material for decorative purposes. It ranges in thickness from 1/32" to 1/8". Older veneers were sawn by hand and are thicker than contemporary ones and often irregular. They were often attached with hide or fish glues. Expensive woods (for example, rosewood and mahogany) are typically used for veneering. Many small pieces of veneer are used in marquetry, inlay, and banding to create intricate patterns and pictures.

Generally the grain of the veneer on tabletops and other large, flat surfaces lies in the same direction as the grain of the underlying wood. In other areas the grains may lie perpendicular to each other, or as in marquetry and inlay, at almost any angle. Fluctuating humidity levels can cause severe damage as the woods expand and contract along different planes. See Figure N.6 for common applications of veneer.

Some areas of veneered furniture are more likely than others to receive damage. For example, the veneer on drawer rails and the bottom rails of case furniture, such as chests and sideboards, is very vulnerable. As the underlying wood shrinks, a lip of veneer forms along the top and bottom edges. The drawer, as it moves in and out, can easily snag the protruding veneer and tear it off. Dust cloths can catch on loose veneer and pull off pieces. Mops, brooms, and vacuum cleaners often cause irreparable damage to the lower edge of bottom rails during routine housekeeping.

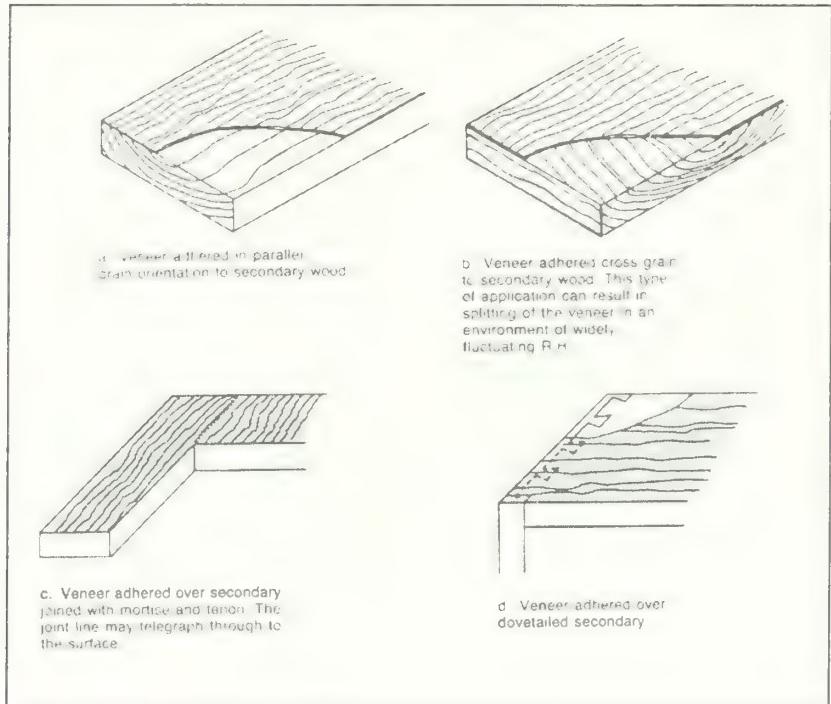


Figure N.6. Common Veneer Applications

5. *Why are finishes applied to furniture and wooden objects?*

Stains and dyes are often applied to wood to enrich or darken the color. They penetrate the surface but do not leave a film. Alcohol- and water-based stains are sensitive to light damage. Oil-based stain is more resilient.

Transparent or pigmented finishes are applied to wood for more than one reason. They are used aesthetically to bring out the color and grain pattern. In other cases the finish may be strictly utilitarian. They preserve the wood by protecting it from spills and light damage and by slowing the transfer of water vapor from the environment.

6. *What types of finishes are used?*

Among the most common finishes found on museum pieces are varnish, oil, shellac, wax, paint, and gilt.

- **Liquid finishes**, including varnishes, oils, and shellacs, are divided into three broad categories: resins, polymers, and paints.

Resins, such as spirit varnishes, are either dissolved or dispersed in solvent. They harden as the solvent evaporates. Shellac is made from the resinous secretion of insects and is the most common finish found on furniture in park museum collections. It was

particularly popular in the 19th and early part of the 20th centuries. Resins are susceptible to damage from water and alcohol.

- *Polymers*, which include most oil finishes, harden by means of chemical bonding (polymerization) and/or oxidation. Linseed oil and tung oil are commonly used oil finishes. They penetrate the wood but do not provide as hard a finish as resins. Linseed oil, particularly, darkens over time as it oxidizes. Misused in the past, in combination with turpentine and beeswax, it has caused damage to many museum pieces. Though serviceable in moderation, in excess linseed oil remains tacky, gathers dust, and severely darkens the wood. Oils are very difficult to remove without damaging the underlying finish. **Do not apply oil to finished wooden surfaces.**
- *Paints* consist of pigment particles in suspension in a binding medium and a solvent. Most paints are relatively stable, however, calcimine and distemper used during the eighteenth and nineteenth centuries were made with a protein glue binder and therefore dissolve in water. **These soluble finishes should be dusted only.**

A few finishes, such as oil-resin varnishes, are a combination of the two.

- *Waxes* are softer and more plastic than other finishes and are readily soluble in most organic solvents. There are few, if any, examples of objects with original wax finishes in park museum collections. **Do not clean a wax finish as you would a hard finish.** Consult a conservator for advice.
- *Gilt* may have been used as a decorative accent on furniture or as a finish over the entire surface. It was most commonly used on ornate picture frames. A gilt finish consists of a gesso layer, a sizing layer, and silver or gold leaf that is metal-hammered into extremely thin sheets. Silver and lesser grades of gold oxidize rapidly. Sometimes the leaf was painted with pigmented shellac to protect it.

Gilt is the most fragile of all finishes, extremely susceptible to damage from rough handling and improper housekeeping. Skin oils can accelerate oxidation, so do not touch the gilt surface. The gesso layer is brittle and often cracked from the expansion and contraction of the underlying wood. Under very humid conditions the gesso will absorb enough water vapor to soften and expand so that it eventually chips away from the wood. **Dust these surfaces gently with a soft bristled brush and a low power vacuum held at least 1/2 inch away.**

7. What is patina?

Patina refers to the distinctive appearance of older finishes. It is used to describe a worn finish, but one with warm tones and satin luster. There is a fine line between patina and a damaged finish. It is important to recognize and protect an unstable finish that may deteriorate further under the existing environmental conditions.

8. *What happens to finishes as they age?*

The aging qualities of finishes vary. Oriental lacquer, for example, is very sensitive to moisture and light damage. Shellac, on the other hand, is relatively resistant to light damage because it allows the light to pass through and consequently harm the stain and wood beneath.

All finishes are damaged to some extent by exposure to high light levels because light accelerates oxidation. Oxidation prevents the finish from expanding and contracting freely with the wood beneath. Minute cracks, called crazing or "alligatoring," may result. Some light-damaged finishes are dull and chalky, while other more severely damaged finishes become unstable, flaking or breaking down into "islands" that lift at the edges.

Fluctuating relative humidity will worsen the condition of finishes made unstable by exposure to high levels of light. High humidity can cause white "blooms" and mildew damage on even stable finishes.

9. *What should I know about the hardware on wooden furniture?*

Drawer pulls, knobs, escutcheons, locks, and other types of hardware are typically made out of brass on decorative pieces and ferrous metal on functional pieces. Brass, an alloy of copper and zinc, will dull and darken as it oxidizes. Polishing brass can damage both the hardware and the surrounding wood. Rubbing with abrasive polishes eventually will wear away the surface of the brass. If the hardware is not removed from the piece for cleaning, the wood finish around and beneath the hardware will likely be damaged or even entirely worn away. Hardware that is not washed after polishing will often show a white or green residue. Green residue indicates the presence of ammonia, which will continue to react with the brass.

Pigmented shellac frequently was applied to brass to protect the shine and give it a more golden tone. This coating, however, is easily scratched. Occasionally the brass on very decorative pieces was given a thin coating of gold in a process called fire gilding. This bright, shiny gold layer will prevent oxidation, but like the shellac is easily damaged. Do not clean fire-gilded brass until you have consulted a conservator.

10. *What potential sources of damage should I look for in upholstered furniture?*

Like wood, upholstery is subject to deterioration from:

- high temperature, which can leave the fabric brittle
- high humidity, which promotes biological activity
- visible and ultraviolet light, which causes all fabrics to fade
- chemical reactions
- bacteria and fungi
- mechanical abuse
- termites and woodworms
- rodents

In addition, look for deterioration from agents that more typically attack textiles. See Appendix K, Section D, for a comprehensive discussion of these:

- pollution, such as dirt and pollen, industrial emissions, and smoke
- fiber-eating insects, such as moths, silverfish, cockroaches, and carpet beetles
- inherent vice, particularly the addition of metallic compounds during manufacture
- oxidation, which discolors white and natural cloths

See *Conserve O Gram 7/4, Upholstered Furniture: Agents of Deterioration*, for a more thorough discussion.

11. Should I ever replace the upholstery?

Yes, under certain circumstances. An upholstered piece in a museum collection may have been re-covered several times during its period of use. The current upholstery fabric may not be appropriate for the period of interpretation or it may be very worn. Because the wood frame might have been damaged by repeatedly attaching the upholstery with tacks, consider using a non-destructive technique when re-covering the piece. See Calinescu and others (1996), for an example of a low-interventive upholstery technique.

E. Preventive Conservation: Controlling the Environment

1. What elements of the environment should be controlled?

To provide a stable environment for wooden objects, control these factors:

- relative humidity
- temperature
- light
- ambient air quality

2. What is the ideal relative humidity for furniture and other wooden objects?

The ideal relative humidity level in most areas of the country for wooden objects is 50% plus or minus 5%. In dry climates, such as the southwest, 35% to 40% is acceptable. These levels are difficult to achieve in very dry climates because the moisture content in wood drops rapidly below 35% RH, causing splits. Below 30% the glue may desiccate, joints may loosen, and finishes will become brittle. Along the coast, 55% to 60% is acceptable, but above 70% mold and insects may become problems. When humidity is this high, glue may weaken, finishes may bloom, hardware will corrode, and wood fibers will swell excessively.

Rapid changes in relative humidity, as mentioned earlier, may cause severe damage to furniture. An increase in RH from 30% to 70% can cause wood to expand as much as 2% across the grain. In this case a 2-foot panel could expand almost 1/2 inch causing splitting, veneer loss, and joint failure.

Avoid temporarily heating, air conditioning, or humidifying spaces that house wooden objects. Do not turn off heat or air conditioning at night.

3. *Why is temperature important?*

Temperature is important primarily because it affects relative humidity. Though changes in temperature alone also will cause some expansion and contraction of wood, this is a relatively minor concern. Elevated temperatures will speed fungal and insect activity as well as oxidation. High temperatures associated with high relative humidity can cause some old finishes to become tacky.

- Consider installing a humidistat to override the thermostat in spaces housing wooden objects.
- Maintain the temperature at the lowest comfort level in exhibit areas and even lower in storage spaces, but be sure to keep it above freezing at all times.

4. *What effect does light have on wooden objects?*

Light will change the natural color of heartwood, making light woods darker and dark woods lighter. It will fade stains and embrittle finishes. It also will fade and embrittle the fabric or leather on upholstered furniture. The level for unfinished wooden objects should not exceed 300 lux. The light level for most finished wood objects should not exceed 200 lux. Objects decorated with fugitive stains and dyes and light sensitive fabrics, such as silk, are more prone to light damage and the allowable light level should be even less.

Limit exposure of wooden objects to both natural and artificial light:

- Install UV filters on windows and florescent lamps to reduce most of the harmful UV radiation.
- Use blinds, shutters, curtains, and roller shades in historic structures to reduce visible light.
- Use reproduction slipcovers to protect upholstered furniture.

5. *How can I control ambient air quality?*

Most modern museums have a variety of filters in their HVAC systems to clean the air and filter out dust and other particulates. In addition, many objects in these buildings are displayed in protective exhibit cases. Historic structures, on the other hand, seldom have good air filtering systems and the furniture is displayed openly. More particulates are generated simply because of the nature of the buildings. Not only is dust abrasive and therefore harmful to wooden surfaces, it is a source of food for mold and is attractive to insects.

F. Preservation Through Good Housekeeping Practices

1. What housekeeping practices should I follow?

The conditions in historic furnished structures require intensified housekeeping both in procedure and frequency. Good housekeeping is essential for aesthetic and preservation reasons. It should be carried out on a regular schedule. See Chapter 13: Museum Housekeeping, to learn about developing a museum housekeeping plan.

Keep this tip in mind when handling wooden furniture and objects:

Don't wear gloves when handling furniture with fragile veneer that might snag or when moving heavy wooden pieces requiring a sure grip. **Do wear them** when handling gilt finished objects or unfinished objects made from light colored wood that might stain.

Frequent and proper housekeeping is critical for the preservation of collections in historic structures.

2. What are the best ways to remove dust?

Because dust is not only abrasive but also attracts moisture, it should be removed periodically to prevent damage as well as to improve the appearance of objects. Remove it from the environment as completely as possible.

- **Use a vacuum** to remove the dust from wood surfaces if possible. (See *Conserve O Gram 7/5*, Dusting Wooden Objects, and *Conserve O Gram 1/6*, Choosing a Vacuum Cleaner for Use in Museum Collections.) Hold the brush attachment just above the wood surface. Use a soft bristled brush to sweep the dust out of crevices and intricately carved areas and toward the vacuum brush. Also vacuum upholstery. (See Appendix K for guidance.) **Keep the vacuum clean.**
- **Use a clean cotton cloth** when vacuuming is not an option. Turn the cloth frequently so that accumulated dust does not scratch the object's surface. Wash the cloth after every use. You may dampen the cloth with water or spray it sparingly with a light mineral oil product, such as Endust®, where low relative humidity creates a static charge, causing the cloth to repel the dust. If using water, be sure to dry the surface immediately. **Do not** use scented oil products.
- **Don't use feather dusters.** They scatter the dust rather than collect it. Broken feathers may scratch the surface.
- **Don't wipe unstable finishes.** This will cause more harm to flaking and lifting edges or surfaces that have loose veneer or splintered corners.
- **Use compressed air** on very fragile objects and irregular surfaces. Limit pressure to about 10 pounds and use away from exhibit areas.

3. *Do furniture and wooden objects require more than thorough dusting?*

Yes. Periodically these require cleaning to remove oils and grime. Objects in storage may need to be cleaned only every ten years while those on exhibit will require cleaning approximately every three years. More frequent cleaning may be necessary if visitors occasionally touch the pieces.

- Use mineral spirits, such as Stoddard solvent or naphtha, on greasy types of soils and hand oils. First test a small inconspicuous area with a cotton swab dipped in mineral spirits. If the finish does not get tacky and no finish comes off on the swab, you may begin careful cleaning with a cotton cloth dampened with mineral spirits. Work in a well ventilated area and wear vinyl gloves. Turn the cloth frequently and wipe the object down with a clean, dry cotton cloth after cleaning.
Note: Some 18th century pieces may still have their original wax finish. Consult your regional/SO curator and a conservator before cleaning furniture that you suspect has an original wax finish.
- Use soap like Vulpex®, Ivory®, and Orvus® and water to remove smoke and soot from stable finishes. Follow manufacturer's instructions for dilution. Never use detergent because it will leave a film on the surface. Again, test a small inconspicuous area before cleaning the entire surface. Wring the cloth well before wiping. When finished, wipe the piece again with a cloth dampened in clear water and then again with a dry cloth. **Do not moisten a damaged, veneered, or inlaid surface.**

Only furniture with a sound finish should be cleaned.

4. *Should furniture be waxed?*

Yes. The application of wax to clear finishes is recommended for these reasons:

- Wax enhances the appearance of the surface by filling in voids and small depressions, creating an attractive level surface.
- Wax helps protect the surface from abrasive dust and handling.
- Waxing makes dusting easier.
- It slows the penetration of water and water vapor, which will cause the wood to swell.

Note: Always rewx the finished surface after cleaning, since mineral spirits will dissolve and remove wax.

5. *What kind of wax should I use?*

The paste waxes recommended for use on wooden objects in museum collections are made with weak organic solvents, such as turpentine or mineral spirits. When the solvent evaporates, the wax film that remains is lustrous, slippery, and plastic. Waxes are derived from animal, vegetable, mineral, and synthetic sources. Natural waxes, like beeswax, have been used for centuries. Most commercial paste wax products are mixtures of various waxes.

- **Don't use** paste wax made with strong solvents, such as xylene and toluene, because they can damage some finishes.

- **Don't use** liquid polishes. They do not offer the same protection as paste and most contain silicones. Silicone migrates into the finish and complicates any future conservation treatment.

6. *What precautions should I take when waxing furniture?*

Apply wax only to stable, clear finishes, such as shellac, varnish, and modern lacquer. **Don't** apply paste waxes to unfinished objects because it will penetrate into the pores. Wax applied to unfinished wood surfaces cannot be completely removed.

Cover the upholstered parts of the piece so that you don't accidentally get wax on the material.

Be careful not to get wax into cracks or splits in the wood. Later attempts to repair the crack with glue would be very difficult.

7. *How often should I apply wax?*

The frequency of waxing will depend on environmental factors, such as dust, relative humidity, and light, and on the amount of handling. When museum objects are used or touched, be sure to wax often enough to protect the underlying finish. Most wood objects in furnished historic structures, however, will require rewaxing just every one to four years. Objects in well-gasketed exhibit cases may only require waxing every ten years. As a general rule, rewaxing is not necessary if the existing wax layer can be buffed to a sheen.

8. *What is the recommended method of applying wax?*

Always follow these procedures:

- Clean the object to remove the existing wax. Waxing over dirty surfaces will produce a grimy buildup and eventually obscure the color and grain of the wood.
- Apply new wax sparingly with a clean, cotton cloth, rubbing first in a circular motion and then along the grain. Wait at least an hour or two for the solvent to evaporate and then buff the wax with another clean, cotton cloth. If the luster is uneven, repeat the procedure. **Note:** It is preferable to apply two thin coats rather than a single thick coat.
- On a carved or irregular surface, apply the wax with a soft toothbrush or shoe polish applicator and buff it out with a soft fiber shoe brush. Tape foam padding to the wooden ends of the brush to avoid damaging the object while buffing.
- Don't apply wax when it is hot and humid. The wax may turn white and cloudy. If this happens, remove the wax with mineral spirits and reapply when the environment improves.
- Remove white specks from pores and recesses left by light-colored waxes with a wooden pick or use a pigmented wax on dark wood.

Refer to *Conserve O Gram 7/2, Waxing Furniture and Wooden Objects*, for more guidance.

9. *What commercial brands of wax can I use?*

There are several good paste waxes on the market. These include Staples®, Butchers®, SC Johnson®, and Trewax®. Renaissance Wax®, a good synthetic with no perfumes or pigments, is frequently used on museum objects. It is durable and highly water resistant. It is recommended for smaller wooden objects, however it can be difficult to buff evenly on large, flat surfaces, such as tabletops.

10. *How do I care for the hardware on wooden furniture?*

The best way to care for hardware on museum pieces is to clean and polish it once and then spray it with a lacquer containing corrosion inhibitors. This treatment requires specialized equipment and the experience of a conservator, but applied correctly, the finish should last up to 20 years.

If this conservation treatment is not feasible, the following on-site treatment is the next best solution.

- First, remove the hardware if this can be done without damage. Tag it to document its original location. If it cannot be removed easily, slip Mylar® sheets behind the hardware, cutting out slits to get by bolts or bails.
- Determine the type of metal and clean it accordingly.
 - Clean brass hardware with alcohol or stoddard solvent, if necessary, to remove fingerprints.
 - Soak iron hardware for several days in kerosene to remove rust and dry it thoroughly. Dip badly corroded iron hardware into a metal preservative called Opho to prevent further deterioration.
 - Softly brush gilded bronze with a weak solution of ammonia and distilled water (1 part ammonia to 40 or 50 parts water). Rinse it with clean distilled water and dry it with a warm, not hot, air-blower.
- After cleaning, you may polish brass hardware with a mild abrasive, such as artist's whiting, that **does not** contain ammonia. **Do not** polish gilded bronze. Be sure to remove all of the polish residue. Use a solvent and wash with distilled water.
- Last, wax all accessible surfaces of the hardware with a microcrystalline wax, such as Renaissance Wax®. Wax will retard oxidation, though not as effectively as lacquer.

See Appendix O for further guidance on cleaning, polishing, and coating metal objects.

G. Preventive Conservation

1. *How can I provide a protective environment for wooden objects in storage?*

Protecting objects in storage is much easier than protecting them while on exhibit. First of all, you can eliminate the warm temperatures and light that often cause damage during display. There are a few requirements, however:

- Storage spaces need to be easily accessible. When storing furniture, avoid areas with narrow stairwells and doors.
- Never store wooden furniture directly on concrete, stone, or brick floors. The end grain on furniture legs and feet will soak up moisture, causing fungal damage and staining. Store on shelves or blocks.
- When using storage shelves, place large and heavy objects on the lowest level. (Slotted metal angle storage systems can be adapted for furniture storage. Be sure to pad the edges.)
- Store wood frames on stationary or moveable racks, like those used to store framed paintings.
- Don't stack furniture.
- Don't store objects in the drawers of period furniture.

2. What is the best way to move large pieces of wooden furniture?

Because furniture is particularly prone to damage while it is being moved, it is important to carefully plan and execute any move.

- Examine the furniture carefully to detect any structural instability, such as broken or loose joints or splits that may not stand the stress of moving.
- Secure doors, drawers, and drop lids or leaves before moving the piece. Use cotton twill tape rather than twine to avoid scratching the finish. **Never use adhesive backed tape.** Remove drawers if weight is an issue.
- Remove marble tops and store them on edge while you move the base. Large marble tops may fracture from their own weight if held horizontally and supported only at the ends.
- Plan your route and measure doorways, stairways, and aisles along the way to make sure the object and the carriers will fit. (Measure the width of a couch or large chair by placing it against a wall and measuring from the wall out to the middle of the seat rail.)
- Use a dolly.
- Don't attempt to move heavy or awkward objects by yourself.
- Never slide furniture across the floor. Sliding puts too much stress on joints and fragile areas and can cause the feet or legs of dressers, tables, chairs, etc. to break.
- Grasp furniture for lifting where it is strongest, usually the lowest horizontal structural member. For example, lift a table by its apron, a case piece by its bottom rail, and a chair by its side seat rails, being careful not to dislodge the slip seat. Never lift a sofa by its arms—grasp the bottom rails, instead. Moving a particularly large and heavy sofa may require four people.

See Figure N.7 below for the proper moving techniques.

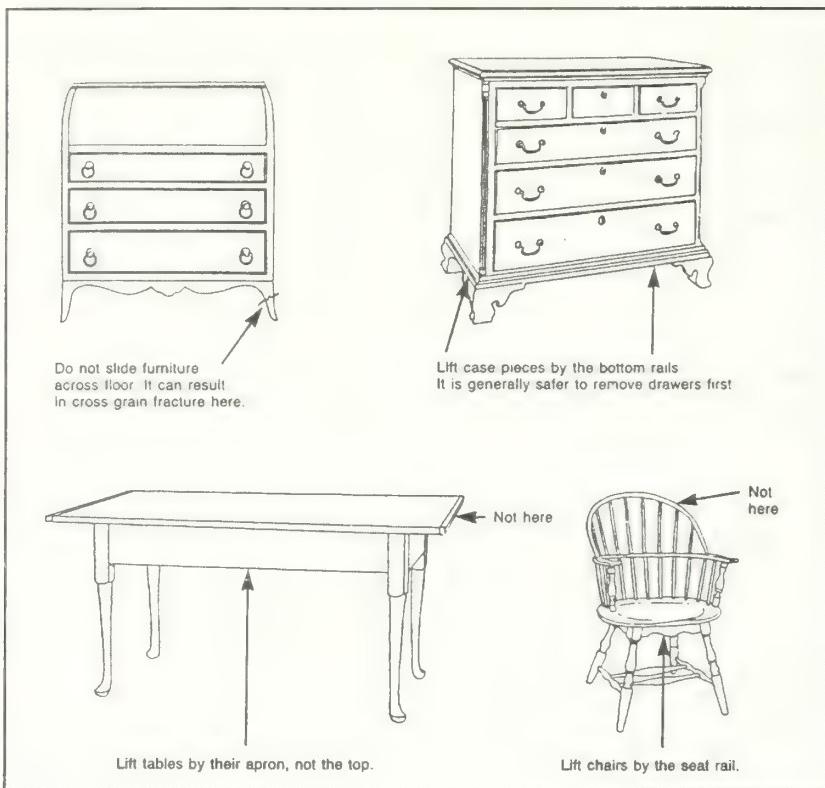


Figure N.7. Proper Techniques for Moving Furniture

3. *What should I do if a part of the wooden piece becomes loose or falls off?*

If small parts become detached because of glue failure, structural failure, or accidents during moving or cleaning, place them in a closable polyethylene bag with a label that documents the date, location from which the piece came, and the catalog number of the object. Keep the bag with the object, if possible, and contact a conservator.

If there is an urgent need to repair the piece, consult the regional/SO curator and seek permission to use a **reversible** glue (for example, hide glue) to reattach the part temporarily. **Do not tack the loose part back into place.**

If more than one piece becomes detached, it usually indicates a problem with either the environment or the housekeeping procedures. The object may be too unstable for exhibit. Seek conservation treatment as soon as possible.

4. *Is there a special technique for removing mold from wooden objects?*

Because mold growth is the result of environmental factors, your first step is to improve the environment.

- Lower the relative humidity level and increase the air circulation.
- Isolate the object from the rest of the collection and place it where it will receive more light.

- Use a HEPA vacuum to remove the mildew from the object and discard the bag, or brush it off, capturing the spores on a drop cloth. A dust mask or respirator may be necessary (see *Conserve O Gram* 2/13, An Introduction to Respirator Use in Collections Management). Dispose of the cloth in a plastic bag.
- Wipe the remaining mold from the object with a solvent-dampened cloth. Use a 50% mixture of alcohol and water on all but shellaced surfaces. Use mineral spirits to clean a shellac finish. Dispose of the cloth.

5. *How can I determine if a wooden object has an active beetle infestation and what should I do about it?*

Evidence of active wood boring beetles, the most common museum insects to attack wooden objects, is easy to spot.

- Examine the surfaces of the piece carefully for *flight holes*—the holes made by these insects as they exit. If there are “bright holes” with sharp edges, the infestation is probably current.
- Look for *frass*, a light-colored powder produced by the larva as it eats the cellulose. It may be found on the floor nearby or on the lower horizontal members of wooden objects.
- Check the windowsills for beetle carcasses during the spring.
- Listen carefully. Some species of wood boring beetles can actually be heard as they chew.

If you suspect an active infestation, isolate the object immediately. Place it on a dark paper or other surface, wrap it with polyethylene sheeting, and monitor it carefully for new frass accumulations. Be careful not to jar the piece, since movement may dislodge older deposits of frass.

Refer to Chapter 5: Biological Infestations, for guidance if you determine that beetles are currently at work.

H. Conservation Treatment

The preservation of wooden furniture and other wooden objects is the responsibility of both curator and conservator. The curator must know how far to go with hands-on housekeeping and when to call the conservator for advice or treatment.

1. *How do I assess the stability of a wooden object?*

Most furniture and other wooden objects in museum collections show evidence of much use and at least some damage. You must be able to determine whether or not that damage makes the object unstable.

An object should be considered unstable when further deterioration is likely to result if the condition is not corrected.

- ***Examine the object carefully for structural stability.*** Look for:

- glue failure
- mechanical joint failure
- missing and loose elements
- cracks and splits
- fungal or pest activity

Loose joints usually indicate environmental problems that have caused the glue to dissolve or become brittle and fail. Not only is conservation treatment needed to stabilize objects with loose joints, but also the environment must be corrected to prevent the problem from recurring.

Missing parts *may* cause structural instability. A lost finial will not; a lost leg will. If a crack or split occurs in a structural member that must support the weight of the object, conservation treatment is needed. If movement is possible on either side of the split, the object should be treated.

Make sure you can distinguish between decay fungi and mold and mildew. Decay fungi consume cellulose and lignin and will eventually cause severe deterioration. Mold and mildew, on the other hand, disfigure the surface of the wood, but do not cause instability. Decay fungi can be detected by the presence of cracks along and across the grain of the wood, a “dead” sound when tapped, loss of weight, a friable surface, and its characteristic odor. If the decay has not progressed too far, the wood can be consolidated during conservation treatment and a degree of structural stability restored.

Like decay fungi, insects can also cause severe damage to wooden objects. The presence of numerous exit holes on the surface of an object indicates the need for a thorough structural examination. See Section H.4 above.

- ***Examine the finish carefully.*** Crazing may or may not require conservation treatment. If the finish is still tightly bonded to the wood surface, it is probably in fairly stable condition. If, however, the islands of finish are loose or are beginning to discolor along the edges, treatment is recommended.
- ***Examine the hardware.*** Look for active corrosion. Dull, oxidized hardware is not necessarily unstable, but active green corrosion on brass or copper hardware should be corrected by conservation treatment. On ferrous hardware, a coating or red or red-orange rust also indicates active corrosion. If corrosion is not stopped, it will deteriorate the metal and may stain the underlying wood.

2. How should I document the condition of furniture and wooden objects?

Periodic documentation should be both written and visual. Measured drawings, sketches, and photographs are very useful when they accompany written descriptions.

- Note the occurrence of obvious damage, such as loss of veneer or scratches from cleaning equipment.
- Note deterioration that takes place over a longer period of time, for example, progressive crazing or fading of finishes. Take photographs and date them for comparison.
- Record the length and width of any split you might see. If it is larger on the next inspection, call a conservator for treatment.
- Compare your documentation of condition with the records from environmental monitoring. Seasonal variations in relative humidity may be responsible for the deterioration.

3. What will a conservator do in the course of treating wooden objects and furniture?

The conservator's treatment will be determined by the condition and intended use of the object. Typically a conservator will follow these steps:

- **Examine the object thoroughly** with the aid of microscopes and specialized photographic techniques to:
 - determine the stability of the structure and the finish
 - determine the causes of deterioration
 - look for evidence of insect and fungal decay
 - identify the type of wood, finish, and adhesive and joinery techniques
- **Clean the object carefully** by mechanical and chemical means to:
 - remove foreign soil buildup
 - remove stains and paint deposits
 - remove unwanted (post-period) surface coatings

The conservator preserves important signs of use.

- **Make structural repairs** by restoring structural integrity, but not necessarily appearance.

Repairs are reversible so that they can be removed if necessary.

- **Replicate missing elements** when desirable with in-kind materials and techniques or modern ones.

The decision to replace missing elements is made jointly by the conservator and the curator. It will depend, in part, on the object's significance and whether or not the size, shape, and design of the missing element are known. Replacements should be:

- documented in writing with accompanying photographs
- labeled with maker and date
- removable
- unobtrusive to the museum visitor, but discernable to the curator
- added with a minimum of damage to the object
- reasonable in cost
- ***Consolidate damaged fibers*** when the wood has been damaged by fungal activity, insect attack, or chemical action. Consolidants can be made from a number of natural or synthetic resins and a variety of solvents. The process, however, results in a visual change to the wood surface and is never completely reversible. Therefore, the decision to use consolidants should be carefully weighed.
- ***Preserve the existing finish*** or replace it if necessary. If the existing finish is original, or at least appropriate, and salvagable, preservation is the preferred course. Preservation may involve:
 - cleaning and waxing, if the finish is stable
 - partially dissolving the finish to lay it down if it is lifting and unstable
 - amalgamation of crazed surfaces
 - filling in areas of stain loss with a reversible finish

Refinishing is preferred if the existing finish is either inappropriate or almost completely worn away. Conservators will use the least harmful means of finish removal and a new finish that is resoluble. A small area is usually left intact to document the finish history of the object. The curator and the conservator should carefully consider the decision to refinish.
- ***Apply a surface barrier*** to protect against moisture, dust, light, and staining. Wax is generally the choice for finished wood surfaces. In some instances, a sheet of acrylic may be used to protect wood surfaces from marring or abrasion.

I. Emergency Procedures for Wooden Objects

1. What is the most common type of emergency?

Most emergencies that affect museum objects involve water. Refer to Chapter 10 for guidance on emergency planning. See Chapter 8, *Conserve O Gram 7/7, Emergency Treatment for Water-Soaked Furniture and Wooden Objects*, and *Conserve O Gram 21/6, Salvage at a Glance Part III: Object Collections*, for emergency treatments for wood objects. You will

probably need to contact a conservator to take care of the preservation problems created by any disaster.

2. *What preservation problems will I encounter during a flood?*

Water damage usually affects the finish and causes wood to swell. If there is standing water on the floor for a period of time, the water and any salts that may be dissolved in it will be carried up through the end grain of the feet and legs of furniture creating "tide" lines as the salt effloresces. Floods and water-damaged ceilings may deposit mud, plaster, or gypsum on furniture surfaces. The high relative humidity levels often result in mold growth. Upholstery fabrics will stain and probably shrink. Hardware will rust.

Moving furniture after a flood subjects it to even more potential damage. Move it only if necessary. Your focus should be on removing the water instead.

3. *What should I do in the event of a flood?*

Take action immediately:

- Remove all water on and around the object as quickly as possible. Lower the relative humidity level slowly to acceptable levels.

Dry out wet wood objects slowly.

It may be necessary to cover affected objects with a polyethylene tent so they will not dry out too quickly.

- Remove drawers and open doors to dry all surfaces evenly. If drawers and doors stick because of swelling, **do not** force them open.
- Raise all objects off the floor so that the water will not migrate up the feet and legs.
- Use fans to improve ventilation and therefore decrease the likelihood of mold, but **do not** aim the fans directly at the furniture.
- Remove ferrous hardware to avoid stains, especially on woods with high acid levels like oak. Tag all hardware, furniture elements, and loose pieces as you remove them.
- Remove the outer fabric, padding, and support from very wet upholstered furniture. Saturated fabric left in place may split as it dries. The padding can be dried relatively quickly without damage. Feather cushions can be dried in a clothes drier at a low temperature.
- Gently sponge any mud or plaster from stable wood surfaces with clean, cool water. Rinse the sponge often. Gritty sponges and dry cloths will scratch the wood. Wait for a conservator's assistance to remove mud and plaster from fragile and unstable finished surfaces, such as gold leaf.

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APPENDIX O: CURATORIAL CARE OF METAL OBJECTS

A. Overview

1. What information will I find in this appendix?

This appendix discusses historic objects made primarily of metals and their long-term care and preservation. The main topics covered in this appendix are:

- the nature of metals
- agents of deterioration
- handling, storage, and exhibit of metal objects
- working with a conservator when treatment is needed
- specific emergency procedures for metal objects

Note: This appendix does not cover metals recovered from archeological sites. Care of archeological objects is discussed in Appendix I.

2. Why is it important to practice preventive conservation with metal objects?

Metals are very reactive and many factors contribute to their deterioration, but a metal object's rate of deterioration can be slowed significantly with proper preventive care. Practicing preventive conservation will also reduce the need for costly and time-consuming conservation treatment.

3. How do I learn about preventive conservation?

Read about the agents of deterioration that affect metal objects so that you can create a preventive conservation plan. See Chapter 3: Preservation: Getting Started, and Chapter 4: Museum Collections Environment, for discussions of the agents of deterioration. Refer to the *Museum Handbook* Part III, Chapter 7: Using Museum Collections in Exhibits, for additional information.

4. Where can I find the latest information on care of metal objects?

There are a variety of resources for up-to-date information on metal objects including:

- NPS *Conserve O Gram* series
- World Wide Web sources listed in Section J
- Selected references in Section K
- Regional/SO curator or collections manager of a large metals collection
- Objects conservators

B. The Nature of Metals and Metal Objects

1. What are metals?

Metallic elements compose the largest proportion of materials that make up our planet. Metallic ores are refined by the application of energy to produce metals. The physical properties of metal include:

- luster
- hardness
- strength
- malleability
- temperature sensitivity

Different metals exhibit different physical properties. Historically, these various properties have been exploited in the construction and fabrication of metal objects and structures. Metals are frequently selected for applications in architecture, decorative arts, fine arts, and functional objects.

2. What are some of the metals found in park collections?

Among the metals found in museum objects are gold, silver, copper, tin, iron, lead, zinc, nickel, and aluminum. Metals are frequently combined in order to modify their properties or to obtain a metal that is most suitable to a given application. The process of combining two or more metals is termed *alloying*.

3. What is an alloy?

An alloy is created by melting one metal and then adding another metal to it. An alloy is a solid solution since the metal elements remain distinct, one suspended in the other. Examples of common alloys are *brass* (a mixture of copper and zinc), *bronze* (a mixture of copper and tin and other metals), and *sterling silver* (a mixture of silver and copper). By varying the proportions of copper and zinc in brass alloys it is possible to obtain a range of brass alloys with differing properties including color, strength, corrosion resistance, or working properties.

4. What are surface treatments of metals?

Surface treatment can be an important characteristic of a metal object. Frequently metals are finished to enhance the appearance of the object, to improve the functional performance (for example, corrosion resistance), or a combination of both. Surface treatments include polishing, plating, patination, coatings, heat treatments, and chemical coloring treatments.

5. Is it important to identify different metals?

Yes. Proper identification of metals is important to housekeeping procedures, accurate interpretive program information, storage and exhibit techniques, climate control, handling methods, and the conservation treatment process.

6. How do I identify different metals?

You can identify metals by color, weight, function, magnetic properties, or hardness. If you are unsure of the metal object's identification, consult a conservator or your regional/SO curator. To identify a metal object properly, you need to have a basic knowledge of the properties of metals and have a few tools and supplies. If you can't identify a metal, it is better to use more generic terms to describe it. For example, describe a metal as a

white metal instead of running the risk of misidentifying it as pewter, silver, or nickel.

DO NOT use chemical spot tests or spark tests to identify metals. This can damage or destroy the object.

Metal	Color	Other Identifying Characteristics	Primary Alloys and Uses
Iron & Iron Alloys	Grey/silver, blue-black and red-brown color.	Some but not all iron alloys are magnetic.	Cast Iron (iron & carbon, 2% to 4%). Kettles, door hardware, fire-backs, stoves. Wrought Iron (pure iron & carbon, not more than .035%). Railings, nails, wagon hardware. Steel (iron & carbon, 0.15% to 2%). Knives, tools, structural materials.
Copper & Copper Alloys	Yellow to rich browns. Surface may be patinated and vary in color from red, brown, black and blue to shades of green.		Brass (copper & zinc). Lighting devices, jewelry, scientific instruments, marine fixtures, cookware. Bronze (copper & tin). Bells, cannons, bearings. Nickel Silver (copper & nickel & zinc). Household decorative objects.
Lead	Pure lead and lead alloys where lead predominates, dull metallic blue in color.	Very heavy & very malleable.	Pipes, pump wells in ships, toys, roofs, bullets, and solder.
Silver & Silver alloys	White metallic appearance.	Sterling silver is usually hallmarked.	Numerous silver-copper alloys such as Sterling, coin silver, jewelry, and tableware.
Nickel	Gray to white appearance.	Metal is slightly magnetic.	Nickel is often used in its pure form as a plate for tableware, kitchenware, and decorative ornaments.
Tin & Tin Alloys	Dull gray.		Pewter (tin & antimony & copper). Kitchenware and plating for tin cans and toys

Figure O.1. Identification of Metals

7. What is corrosion?

Corrosion is the chemical or electrochemical reaction between a metal and its environment that produces deterioration of the material and its properties. It is the most commonly occurring problem of metal objects. Corrosion can take many forms depending on the metal(s) that compose the object, the manner in which they are fabricated, or the environment in which they are exhibited or stored. At times, the corrosion source may be from fabrication in the case of stress corrosion cracking in thin turned brass objects or contamination from solder flux in joined metals. In other instances, the conditions responsible for corrosion may be an integral part of the environment, such as a seacoast or polluted urban air.

8. Is all metal corrosion harmful?

No. The presence of a corrosion product on a metal object does not necessarily indicate active corrosion. Corrosion, tarnish, and patination are all examples of metal compounds, some of which are unintentional and considered disfiguring, while others are deliberately created for an aesthetic effect. While some forms of corrosion are more protective and stable than others, almost all are subject to failure at some critical relative humidity level or in the presence of certain pollutants. When metals are cleaned the surface can oxidize and be chemically stable.

9. How can I identify active corrosion?

Active corrosion can be identified visually by the following characteristics:

- color (wet or dry in appearance)
- powdery or flaky formations on the surface of the object and similar deposits around the base of the object
- loosely adhering formations, frequently appearing in patches on the surface as opposed to uniform, dense, well-adhered deposits
- continuing change or growth

10. What are the characteristics of corrosion for different metals?

Surface characteristics and colors of metals vary by alloy. Corrosion products also vary in color, depending on the alloy and cause of corrosion.

See Figure O.2 for additional information.

CAUTION! Lead acetate corrosion is a severe poison that can be fatal if swallowed, inhaled, or absorbed through the skin. If you see white, crystalline corrosion products on lead objects in your collection, assume that they are lead acetate and handle accordingly. Material Safety Data Sheets uniformly state that protective equipment for lead acetate should include goggles, lab coat, vent hood, and rubber or plastic gloves. This type of corrosion is often seen on lead bullets and toy soldiers.

Metal	Active Corrosion	Stable Surfaces	Causes of Corrosion
Iron & Steel	Orange to reddish-brown. Wet or glossy appearance. A surface that is scaling, flaking or pitting.	Compact blue-black and red-brown color.	High relative humidity, surface moisture.
Lead	Loose white powder in tiny spots or overall.	Smooth gray surface.	Weak organic acid vapors, from sources such as wood, cardboard, and vinegar.
Copper & Copper Alloys	Corrosion forms in small spots overall. Powdery green, blue, and white corrosion products that are generally over the entire surface.	Wide variety of colors: solid blue, green, red, brown, or black. Surfaces are smooth and tightly adherent.	High relative humidity, surface moisture, air pollution, salts from inappropriate cleaning and handling.
Silver and Silver Alloys	Slight gray dullness through blue/purple that deepens to brown/black as corrosion becomes thicker.	Smooth white metallic. A blue/purple surface can be stable if it occurs overall and the object is removed from the source of corrosion.	High humidity, sulfur compounds, etching from fingerprints, organic vapors.
Nickel	Nickel corrosion is reddish brown and is similar in appearance to rust. Green copper corrosion products indicate preferential corrosion from a copper alloy.	Smooth gray appearance.	High humidity and sulfur compounds.
Tin & Tin Alloys	White gray, dark gray to black. Nodules of white to gray corrosion that form under the surface layer in nodules that erupt through the surface exposing a light gray or white corrosion product.	Smooth gray surfaces.	High relative humidity, atmospheric pollutants, low temperatures.

Figure O.2. Identifying Active Corrosion

C. Factors That Contribute to Metal Object Deterioration

1. What agents of deterioration affect metal objects?

The primary causes of metal object deterioration in the museum or historic furnished house are:

- relative humidity
- temperature extremes
- atmospheric pollutants

- improper care and handling
2. *What is the best relative humidity and temperature for my metal objects?*
- Keep relative humidity in metal collections as low as possible. Steels will not rust and brass will not tarnish below 15% RH. This is not a practical solution for metal objects in the historic furnished structure, but it may be for objects in storage cabinets or exhibit cases. Ambient temperatures between 60° and 75°F are appropriate for most metals. To inhibit active corrosion in salt air environments, metals should be housed in spaces with relative humidity levels no greater than 35%.
- It is generally a good idea to avoid low temperatures for most metal objects. Low temperatures usually result in higher levels of relative humidity and the possibility of condensation on metal surfaces.
3. *Should I be concerned about atmospheric pollution?*
- Yes, many forms of air pollution are corrosive. Polluted urban air and coastal environments are among the more severe areas. Dirt and dust may contain chemical compounds that will react with metals or trap moisture close to the metal surface. Sulfur and sulfur compounds are probably the strongest tarnishing agents. Sulfur is present in the air from burning of fossil fuels and is generated from products such as foam rubber, carpet padding, paints, wool, and felt.
4. *Does cleaning contribute to deterioration?*
- Cleaning and polishing remove original metal. Over-cleaning often results from a desire to have metals bright and shiny, especially brass and silver objects on display in a historic furnished structure. Intense treatment often results in the loss of information from the object. In addition, metal cleaners may leave harmful chemical residues that can generate further corrosion.

D. Proper Handling and Storage of Metal Objects

1. *What do I need to know about handling metal objects?*
- All of the general rules for safe handling of three dimensional museum objects apply to metal objects. Refer to Chapter 6: Handling, Packing, and Shipping, for general guidance on handling museum objects. Two special concerns for metals are the weight of the object and skin contact with bare metal surfaces.
- Metal objects can be heavy. The inadvertent placement of a heavy metal object on another object or on a period piece of furniture may result in dents, scratches, or staining.
 - Transport heavy metal objects on carts or dollies.
 - Most metal objects should not be handled with bare hands. Salts and oils from your skin can etch metals and may even cause permanent damage.
 - Always wear clean cotton, latex, or synthetic rubber gloves when handling metal objects. Avoid cotton gloves if the decorative surface is friable. Avoid cotton gloves with polyvinyl chloride (PVC) nubs when handling metal objects. PVC residues from the nubs may cause oxidation or tarnish. Synthetic rubber gloves are not recommended for handling silver or copper alloys because some brands contain high proportions of sulfur and chlorides.

See caution in B10 on handling corroded lead objects

2. *Can I use a jeweler's cloth after handling uncoated metal objects?*

Yes. A jeweler's cloth can be used to wipe or buff away fingerprints on uncoated gold, silver, copper alloys, and highly polished steels, if an uncoated metal object is inadvertently touched. Select cloths that contain no abrasive, and rely instead, on the stiffness of the weave for their polishing effect. Any clean, soft cloth may be used to buff an object after handling.

3. *How should I store my metal objects?*

Follow these guidelines:

- To the extent possible, house metal objects indoors to reduce exposure to rain and temperature extremes.
- If possible, keep all metal objects together. Further isolation can be made according to metal type, object size, and object type.
- Never store metal objects directly on the floor or in close proximity to exterior walls. Avoid storing metal objects in attics and basements.
- Metals are normally immune to biological attack; however, the droppings of pigeons, mice, and even insects will cause pitting and corroding of a metal object's surface.
- Keep metals away from hygroscopic materials such as paper, textiles, and wood.

4. *What kind of shelving and cabinetry should I use?*

Follow these guidelines:

- Steel shelving is preferred over wood shelving because it is stronger and it does not emit harmful vapors. Line shelves with an inert, nonabsorbent material such as expanded polyethylene.
- The standard museum specimen cabinet provides excellent storage for metal objects. Depending on degree of seal, some of the newer museum storage cabinets can be used to create microenvironments using silica gel to control RH.
- For heavy metal objects such as cannon tubes and sculpture, polyethylene plastic pallets are available to prevent contact with the ground or floor.
- Loosely drape clear polyethylene over shelves to protect metal objects from water leaks and dust.

5. *What additional protection do metals need in storage?*

You may need to use microclimates to protect some collections. Consult with a conservator to determine which collections are most vulnerable. A conservator may recommend:

- **Activated charcoal paper:** Activated charcoal absorbs air pollutants.
- **Silica gel:** Silica gel can be used to reduce and to buffer the relative humidity of an enclosed space. The bags must be monitored and reconditioned as necessary. See COG 1/8, "Using Silica Gel in Microenvironments."
- **Vapor phase inhibitors:** These materials release a vapor that inhibits corrosion. **Note:** Many vapor phase inhibitors are toxic.
- **Clear plastic boxes & bags:** Various plastic boxes and bags can be used to create microenvironments and allow conditions to be monitored inside.

E. Exhibiting Metal Objects

1. *What do I need to consider when planning an exhibit?*

Conditions within the exhibit space are usually more subject to change than those in the storage space. This is especially true for historic furnished structures. The goal is to create an exhibit environment that is just as safe and controlled as possible. All of the general rules for safe display of three-dimensional objects apply to metal objects. Refer to the *Museum Handbook*, Part III, Chapter 7: Using Collections in Exhibits, and NPS *Exhibit Conservation Guidelines*, available from the Harpers Ferry Center.

2. *Are there any particular concerns for exhibiting metal objects?*

Consider the following:

- Cast and wrought iron objects are often exhibited in hearths, on mantles, or hung on the fireplace. Rainwater may enter through the flue, and brick and mortar will trap the moisture. In addition, chimneys are usually cold. All of these conditions promote condensation and corrosion.
- During seasonal transition periods, fluctuations of temperature and relative humidity can promote condensation and corrosion on metal objects.
- Frequent cleaning of exhibit areas may add moisture and potentially harmful vapors to the environment.
- Ensure that exhibit mounts are padded to prevent scratching

3. *Are there any specific situations that should be avoided when exhibiting metal objects?*

Follow these guidelines:

- Avoid leaving doors and windows open as gaseous and particulate pollutants can enter the exhibit area causing corrosion. This is a particular concern in urban areas.

- Avoid lighting fixtures such as fluorescent light ballasts or transformers that may generate ozone. Ozone will cause corrosion on metal surfaces.
- Avoid using hardwoods, such as oak, in exhibit cases because they can emit acidic vapors that corrode lead and silver.
- Avoid the use of adhesives, paints, woods, and textiles in exhibition cases and exhibition spaces unless they have been tested for off-gassing. See Chapter 4: Museum Collections Environment, for information on gaseous air pollutants and safe construction materials for exhibitions.

4. *What should I know about cleaning metal objects?*

Be aware that many proprietary cleaning products contain ammonia, weak acids or bases, solvents, waxes, and fats that may have an adverse effect on metal objects. Refer to Chapter 13: Museum Housekeeping, for additional information.

F. Conservation Treatment

1. *Why should I contact a conservator?*

All interventive treatment must be undertaken by a conservator trained to examine, analyze, stabilize, and treat objects. Conservators are trained in the treatment of specific materials. See Chapter 3: Preservation: Getting Started, and Chapter 8: Conservation Treatment, for information on choosing and contracting with a conservator. Be sure you check references and question the experience and background of any conservator you choose. Discuss any recommended treatments and be sure you understand what is planned and why it is necessary.

Only experienced conservators who agree to follow the AIC Code of Ethics and Guidelines for Practice should be allowed to treat NPS museum objects.

2. *What might a conservator be able to tell me about my metal object upon examination?*

When conservators examine metal objects they can tell you a number of things, including:

- the type of metal
- the type and source of any corrosion product
- the range of possible conservation treatments

3. *Should protective coatings be applied to metals?*

Protective coatings are often applied to metal objects to prevent or reduce the possibility of corrosion from high humidity, frequent handling, atmospheric pollution, and to reduce the need for aggressive cleaning such as polishing.

4. *Who should clean and apply coatings to metal objects?*

All metal objects are best left **untreated** until an objects conservator has had an opportunity to examine them. Cleaning involves the risk of over-cleaning, exposure to hazardous solvents and chemicals, and the consequence of higher corrosion rates on freshly exposed metal surfaces.

A conservator should specify the most appropriate coating for an object and determine who best can apply the coating. With appropriate training by a conservator, collections management staff can be trained to coat metals with wax. The scope of treatment may be expanded to include other barrier coatings or corrosion inhibitors. This type of treatment is especially good for objects stored or exhibited outdoors.

5. *What are some common metal coatings?*

The most common metal coatings are:

- waxes
- lacquers
- corrosion inhibitors

Some preventive conservation measures for metal objects require hands-on methods. Preventive measures should mitigate frequent handling of the object, be easy to apply and to remove, and be safe for both the object and the person applying the material. Wax is an example of such a material.

Before applying any surface coating it is very important to properly identify the metal surface. Ask an objects conservator to conduct a Collection Condition Survey that includes current condition and provides information about routine maintenance.

- **Waxes.** Waxes are easy to apply, relatively safe and easy to remove, and provide reasonably long-term protection to the metal surface.
 - Waxes may be natural or synthetic.
 - The metal object should be polished, washed, thoroughly dried, and buffed before waxing.
 - Most waxes suitable for use in an exhibit space can be applied at room temperature.

Be aware that waxes will collect dust, are a food source for some molds and fungi, and may blanche or turn white.

- Avoid natural waxes such as bees wax, which may be acidic. Use instead manufactured microcrystalline waxes as specified by a conservator.

- **Lacquers.** Lacquers, like waxes, can be natural or synthetic. Generally, synthetic lacquers and waxes are considered to be more stable than those derived from natural products. The objections to protective lacquer coatings are not well founded. A common objection is that lacquers make a metal object look "plastic." Matting agents are available if necessary. Considering the difference in wear caused by frequent polishing or less frequent waxing, the lacquer finish provides the toughest and the longest lasting protection.

Lacquers are more difficult to apply and to remove than waxes.

- Lacquers are harder than waxes and will usually last for five to ten years before reapplication is necessary.
- Certain solvents used in lacquers, such as toluene or xylene, pose health hazards. An objects conservator should be consulted and asked to apply the lacquer coating or to train the staff in the use of these materials.

Lacquers when properly applied will not adversely affect the appearance of an object.

- **Corrosion Inhibitors.** Corrosion inhibitors react with the surface of a metal object to prevent corrosion. Some corrosion inhibitors are available commercially and others can be obtained from chemical supply houses. They also may be incorporated into waxes and resins. This provides an additional degree of protection should the wax or resin be scratched. Most corrosion inhibitors are metal specific.

Keep in mind that corrosion inhibitors are not fool proof. Any metal treated with an inhibitor is still subject to corrosion at or above the critical relative humidity for that metal. For that reason, coatings, inhibitors and environmental quality should be considered an integrated system requiring ongoing maintenance.

CAUTION! Many corrosion inhibitors are toxic.

G. Emergency Procedures For Metal Objects

Metals are very reactive materials. In an emergency situation, corrosion can cause irreversible damage to inorganic materials, complicating their salvage. If the metal object has survived a fire and the deluge of water, a flood, or a storm, the first course of action is to isolate it from other materials.

Be sure to:

- Implement security precautions for precious metals and objects of intrinsic value such as metal sculpture.
- Provide a secure dry storage area for all metal objects.
- Have an objects conservator prepare a Collection Condition Survey that documents each object's condition, recommends needed conservation treatment, and outlines remedial preventive conservation procedures.
- Rinse, sponge, and blot metal objects. Air dry.
- If the object has an applied finish, do not clean it. Air dry. Keep flaking surfaces horizontal.

Refer to Chapter 10: Emergency Planning, for information about planning for emergencies and minimizing damage.

In an emergency situation, do not attempt to perform interventive treatments on metal objects.

H. Special Considerations for Archeological Metal Objects

Considerations for the care and conservation of archeological metals are considerably different than for historic metals. Care of archeological metals is discussed in Appendix I.

I. Glossary

Abrasion: the wearing, grinding, or rubbing away of surface material by friction, usually through the action of particulate matter (e.g., sand) or as a result of rubbing by people, animals, or plants

Accretion: the accumulation of extraneous materials on the surface of an artifact, sculpture, or monument. It may include core materials, deposition of insoluble salts, or even the heavy accumulation of dirt, grime, pollutants, or bird droppings.

Acid deposition: the deposition of acidic constituents onto a surface. This occurs not only by precipitation, but also by the deposition of atmospheric particulate matter and the incorporation of soluble gases.

Acid precipitation: rain, snowfall, or atmospheric moisture below pH 7

Alloy: metallic material composed of two or more elements intimately mixed

Amalgam gilding: a process for applying gold to the surface of another metal, usually a copper or silver alloy, by forming a paste of mercury and gold

Annealing: a process of heating and cooling sheet metal, which has become work-hardened by hammering, spinning, or stamping, in order to relieve stress and to return the metal to a malleable state

Anode: the positive electrode of an electrolytic cell at which oxidation is the principal reaction. Electrons flow away from the anode. Usually the anode is where corrosion occurs and metal ions enter solution.

Bimetallic corrosion: corrosion resulting from dissimilar metal contact; galvanic corrosion

Brazing: a method of joining nonferrous metals using a nonferrous alloy that melts at a lower temperature than that of the metals to be joined. Brazing is similar to soldering; the distinction being that soldering is accomplished at temperatures below 800°F, and brazing is done above 800°F.

Bronze: an alloy of copper and tin and sometimes other elements

Bronze disease: copper corrosion in which chloride is the primary corrosive agent. It is rare, but may develop on archeological specimens or objects that have been recovered from the sea.

Burnish: a method to smooth rough surfaces of a metal by rubbing a hard stone or highly polished, harder metal over the surface

Casting: an object created by pouring molten metal into a mold

Cathode: the negative electrode of an electrolytic cell. Electrons flow toward the cathode in the external

circuit. Corrosion does not occur at the cathode (see Anode).

Chasing: a metal finishing technique intended to sharpen or add detail on an object. For sculpture, the term is expanded to include all finishing techniques.

Cheering: surface cracking in a checkerboard-like pattern often associated with the degradation of a protective coating

Chemical conversion coating: a protective or decorative nonmetallic coating created by treating the metal with an acidic or basic compound. Examples are coatings on iron produced by tannic or phosphoric acid.

Coating: a protective barrier, usually a synthetic resin or a wax, applied to a metal surface

Corrosion: the electrochemical degradation of a metal, due primarily to the loss of electrons and the recombination of metal ions with other electro-negative elements such as oxygen, carbon, sulfur, chloride, and nitrogen

Critical humidity: the relative humidity above which atmospheric corrosion rates of some metals increase sharply

Electrolytic cleaning (electrolytic reduction, electrolysis): a powerful method of cleaning metals used particularly if they are heavily corroded or salt contaminated. An object is wired to a low voltage direct current and is suspended between metal plates in a conductive solution.

Electroplating: the deposition of a metal from a solution of one of its salts onto a metal surface using an electrical current

Electrotyping: a process identical to electroplating. Electrotyping is used to build up thick metallic deposits on the interior of nonmetallic molds. It might be thought of as an electrolytic form of casting.

Embossing: raising a design in relief on a surface

Engraving: a decorative technique in which metal is removed by cutting into the surface with gravers

Etching: the production of patterns on a surface by the use of a corrosive chemical agent

Ferrous metals: composed of iron as the dominant metal

Filigree: decoration by means of thin, twisted wire soldered together into an openwork structure

Finishing: cleaning, polishing, patinating, and coating metal

Flux: a substance applied to metals being welded, soldered, or brazed to improve flow

Forging: shaping metal, usually steel and iron, by hammering while the metal is hot

Galvanic corrosion: accelerated corrosion of a metal because of an electrical contact with a more noble metal

Gild: to overlay with a thin covering of gold

Glass bead peening: dry blasting of a surface with glass microspheres

Graver: a chisel-like tool used for engraving metal surfaces

Inclusions: particles of impurities, such as mold materials, ferrous metal, or slag

Incralac: synthetic resin that contains the copper corrosion inhibitor, benzotriazole

Intergranular corrosion: preferential corrosion at, or adjacent to the grain boundaries of a metal or alloy

Inhibitor: a chemical substance that prevents or reduces metallic corrosion

Lacquer: an organic resin coating. The resin may contain matting agents or corrosion inhibitors. Some historic resins were pigmented.

Lost wax casting: a casting technique that utilizes a wax model or pattern. A refractory mold material is used to cover the wax pattern. The mold is later heated, the wax melts, and molten metal is poured into the resulting hollow.

Machining: shaping of metal with machines such as the lathe, planer, milling machine, drill press, and grinder

Metals: elements or mixtures of elements that possess high electrical conductivity and a lustrous appearance in the solid state

Mold: a form containing a refractory void (mold cavity) into which molten metal is poured during casting

Nonferrous metals: not composed of iron

Passive: the state of a metal surface characterized by low corrosion rates

Patina: a colored layer on the surface of a metal. This term is usually, but not always applied to copper alloys. The layer may be naturally occurring or artificially produced.

Planishing: a forming technique utilizing stakes and highly polished hammers to shape sheet metal

Plating: a thin layer of metal deposited on the surface of another metal

Raising: forming a hollow shape in metal by hammering on the outside surface over a dome headed stake or anvil

Repoussé: a technique whereby hammering from the inside produces raised areas on the outside of a sheet metal object

Rust: a corrosion product consisting of hydrated iron oxide. This term is properly applied only to ferrous alloys.

Sand casting: a casting technique that uses sand or sandstone as the refractory mold material

Sandstone casting: a casting technique that uses sandstone as the refractory mold material

Soldering: the use of alloys that flow at low temperatures to join two or more metal parts having higher melting points

Spinning: a metal forming technique in which sheet metal is rolled over a form on a lathe

Stamping: impressing a design into sheet metal with a metal die

Steel: an alloy of iron and carbon, with a carbon content between 0.15 and 2.0%

Stress-corrosion cracking: a cracking process that requires the simultaneous action of a corrosive agent and

sustained tensile stress

Tarnish: discoloration of a bright metal surface by a thin film of corrosion products

Tinning: covering a metal surface with tin

Tin Pest, Tin Disease: deterioration of tin caused by changes in the crystal structure at low temperatures (below 56°F)

Welding: joining two pieces of metal at a temperature close to their fusion point

J. Web Resources

American Institute for Conservation Disaster Recovery Page: <<http://palimpsest.stanford.edu/aic/disaster>>.

Conservation OnLine, Resources for Conservation Professionals: <<http://palimpsest.stanford.edu>>.

Conserve O Gram Leaflets: <<http://www.cr.nps.gov/museum/publications/index.htm>>.

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APPENDIX P. CURATORIAL CARE OF CERAMIC, GLASS, AND STONE OBJECTS

A. INTRODUCTION

Glass, ceramics, and stone (all inert materials) are often erroneously considered non-problematic, requiring little more than a periodic washing. Although fashioned from durable materials, these inorganic objects are fragile and brittle. Preventive conservation such as proper handling and careful maintenance will add indefinitely to the lives of museum objects made of these materials.

National Park Service collections are extremely diverse as they represent the rich and varied material culture of this country. The glass, ceramics, and stone collections may contain a potpourri of object types including marble busts, ceramic bowls, glass vases, mantelpieces, clay figurines, reverse paintings on glass, or stone beads and tools. Alternatively, a collection may be very material specific and contain only Native American ceramics, Prehistoric arrowheads or presidential porcelain. Understanding the nature of these materials and how they were manufactured will aid the park curator in implementing the most appropriate course of action for each object's preservation.

Objects fashioned from inorganic materials are those most likely to survive in an underground context. Refer to Appendix I for special guidance on the care for archeological objects.

B. THE NATURE OF CERAMICS, GLASS, AND STONE

1. Materials and Manufacture of Ceramics

a. Material Makeup and Structure

The principal material in ceramic objects is clay. Clay is defined as a fine grained mineral (e.g., hydrated silicate of alumina), produced by the weathering of certain rocks. It is plastic when mixed with water and becomes rock-like when fired at high temperatures.

Very few clays found in nature are ready to be shaped and then fired. Clay must undergo an extensive preparation process to be made into a suitable clay body. Sometimes weathering is needed to further break down the clay particles. Other mineral materials are added to the principal clay to effect certain working characteristics. The final clay mixture is then subjected to wedging, or kneading to create a homogeneous body that is free of air pockets. A good clay body is composed of clay, nonplastic additive, and flux.

The mixture and proportion of materials can be manipulated to affect a clay body's working properties: color, texture, and firing reaction. Fluxes such as soda, mica, potash, magnesia, or lime serve to lower the firing temperature. Examples of nonplastic additives are organic materials (e.g., shell or plant fibers), volcanic ash, or bits of fired ceramic. These materials are added to make a usable body by reducing shrinkage during drying and firing, reducing the amount of water needed during formation, and increasing porosity.

1) Clay bodies

There are several types of clay bodies, each with distinctive characteristics.

Adobe is a heated but unfired clay-mud mixture that is used to make bricks. The bricks are sun dried. The heat is not high enough to cause a physical change in the body.

Earthenware is made from clay. These clay bodies are fired to a low temperature, generally between 950-1100°C, where vitrification (the progression of the clay to a glass-like state effected by firing) does not occur but the body does harden. (Terra cotta bodies, used primarily in architectural contexts, are made of the same low grade fired clay but are fired below 950°C.) A low-fired body will be structurally weaker than a high-fired body of comparable size. Earthenware objects are generally thicker than other wares because of this inherent weakness. They are soft and will scratch easily. A cross-sectional view of a glazed earthenware ceramic object shows that:

- it is porous and will readily absorb water unless it is glazed;
- the clay body is not glassy but may well be granular in appearance with numerous coarse particles;
- there is a clear distinction between the glaze layer and the ceramic body; and,
- the body is often red in color from the large amount of naturally occurring iron in the clay; brown, black, or yellow bodies are also possible.

Stoneware is made from a mixture of various clays but it is fired to a higher temperature so that the body begins to vitrify at approximately 1100-1350°C. Stoneware bodies have the following characteristics:

- they are partially vitrified and will absorb less water than low-fired ware;
- the body is harder, denser, and does not scratch easily as compared to earthenware;
- color ranges are buff, brown, or gray;
- when tapped lightly, the body will give a distinctive ring; and,
- the chemical bond between the glaze and body is strong.

Porcelain requires the highest firing temperatures to mature, generally above 1300°C, and has properties approaching those of glass. It is made of kaolin clay that is difficult to work without the addition of more plastic clay. The porcelain body is the most unyielding of the ceramic bodies, so the firing conditions must be precise. Though easily deformed, it is possible to create extremely thin, delicate ware. When fired, porcelains exhibit these characteristics:

- the body is completely vitrified and completely impervious to water;
- the ware is extremely hard and brittle;
- the body is white and translucent;
- when tapped, they have a higher ring than stoneware; and
- in cross-section, the glaze and body will be nearly indistinguishable.

2) Glazes

The majority of ceramic bodies are glazed in order to render the surfaces non-porous for utilitarian purposes or to provide decorative effects. The addition of glaze to the clay body makes the piece stronger. Glazes vary widely in appearance, with differences in color and texture derived from myriad combinations of oxides and additives. Most glazes fall into several distinct categories based on their chemical constituents. The types most commonly encountered are as follows:

Lead glazes are formulated around lead oxide. Lead oxide melts at a very low temperature. Depending on the combination of materials, lead-based glazes are usable at a wide range of firing temperatures. They are popular because of their easy application, reliability in firing, and potentially simple formulations. Lead glazes characteristically produce smooth glassy surfaces in a diverse range of colors and transparencies. Such low-fired ware is easily scratched since lead glazes are relatively soft. Another disadvantage of lead in glazes is a health concern. The danger arises when improperly glazed wares contact weak acids such as those contained in tomatoes, vinegar, and fruit juices. The glaze must be combined with a frit (e.g., glass powder) in order to render the lead insoluble. Lead that is properly fritted is nontoxic.

Alkaline glazes contain alkali fluxes (e.g., sodium, lithium, or potassium). They are fired at low temperatures. The characteristics of these glazes are brilliant coloration, a tendency to craze or crawl, and low durability. In addition to scratching easily, the glaze may also remain slightly soluble after firing, if the alkali is not adequately fritted.

High-fire glazes, used on stoneware and porcelain, have feldspar as the primary ingredient. High-fire glazes tend to be simple in formulation. In fact, feldspar can be used as a glaze by itself. The melting point of glazes increases as the number of fluxes in the formulation decreases. These glazes are quite glass-like, forming a hard, smooth, and durable surface. The color range is narrow and tends to be more subdued than in low-fire glazes.

3) Other surface treatments

There are a number of other surface treatments in addition to the basic glaze groups mentioned above.

An **engobe** is a thin layer of colored clay, also known as a slip, that is applied to the surface as a decorative element. The slip is applied to the surface of the object before the first firing. Since it is made of clay, it will have a matte appearance after firing rather than appear glassy like a glaze.

Underglaze colors are painted onto the surface of bisqueware (e.g., unglazed fired ware) then covered with a protective transparent glaze. Underglaze painting is generally used to add fine detail. The colors are derived from metallic oxides (e.g., cobalt or iron).

Overglaze decoration can be applied by two methods. In the first method, details are brushed onto a background of raw glaze and fired in one step. The various glazes meld into one another so that the design is somewhat soft in appearance. In

the second method the glaze details are applied onto a glazed surface and refired at a low temperature. Low temperatures allow a wide range of bright color but they are not as durable as higher-fire glazes.

A luster glaze (including gilding) is actually a thin layer of metal that has been deposited on the surface. The metal is derived from a metallic salt that is mixed with other materials that serve to hold it onto the surface in preparation for firing. Luster glazes are often fired during a second firing and should be considered somewhat fragile.

b. Production Processes

1) Forming Methods

A combination of methods can be used in the production of a single object.

Hand built ceramic objects can be created by several methods. A slab built object is formed when clay is rolled flat, cut into slabs, and assembled by pressing the edges together. A ball of clay can be pinched and manipulated to form relatively small objects. Clay can be shaped into ropes and coiled, then pinched together to form a vessel.

Wheel-thrown ceramics are formed when a lump of clay is hand shaped on a rotating wheel. The base of a wheel thrown piece is generally flat and often there are concentric striations on the surfaces.

Mold pressed ware is made by pressing a slab of clay into an open mold. This method works well for shallow ware (e.g., plates) that is difficult to throw.

Cast objects are made when a thin clay slurry is poured into an absorbant plaster or ceramic mold. The water is drawn out of the slurry, leaving the thickened clay on the sides of the mold. As the clay continues to dry it separates from the mold. The mold is removed and the freestanding body is fired. Delicate porcelain objects are often cast from molds.

2) Firing Methods

While there are several types of kilns used in the production of ceramics, the principle for the various designs is the same. The kiln is designed to house the objects, control the amount of oxygen and heat introduced, and hold the heat that enters the firing chamber.

The objective in firing a ceramic object is to fuse the clay together to give the body the desired hardness. Each clay formulation has a temperature range in which it can be successfully fired.

Firing can take place in one or a number of steps. In the course of firing, the clay body undergoes a series of chemical changes.

- a) After the ceramic object is fully formed, it is allowed to air dry. Prepared clay can contain up to 25% water. This large proportion of water means that a certain amount of shrinkage is inevitable. Slow and even drying is important to prevent cracking of the body. Air dried objects are referred to as being in the leatherhard state. This initial drying stage allows the water between the clay particles to evaporate.
- b) There are two types of glaze firing. Liquid glaze can be applied directly to leatherhard ware and fired. The body and the glaze vitrify together. This process is known as "through firing" and produces "once fired" ware.

Most objects undergo multiple firings. The first firing is called the bisque firing. The ceramic object is heated to about 600°C that serves to strengthen and prepare the body for glazing. The second firing is the glaze and major firing. Liquid glaze is applied to the cooled bisqueware. Vitrification begins at about 800°C and progresses throughout the firing.

- c) An additional low temperature firing is used when overglaze decoration, gilding, decals, and enamels are applied. The temperature range is about 600°-900°C.

3) Flaws in ceramic bodies and in glazes

It is important to know that flaws that have occurred in the clay body or glaze during firing are part of the manufacturing process and are not necessarily a sign of progressive deterioration.

a) Ceramic body flaws

Warping may result with uneven heating or cooling during firing.

Spalling or delamination of parts of the clay body can result if the firing temperature is not high enough.

Sagging is caused by firing at a temperature that is too high for the clay body.

Cracking will occur if the object is cooled too quickly.

Bloating occurs when the heating is too rapid. The gases that are formed during firing do not have enough time to be released and are trapped in the body.

b) **Glaze flaws**

Numerous glaze flaws are a result of the mismatch of the glaze to the clay body. When combining a glaze and a clay body, the two parts should have compatible rates of expansion when fired and cooled.

Crazing appears as a fine network of cracks on the surface of the fired glaze. The crazing results when the glaze is under tension, that is, it is too small for the area it covers. The glaze contracts more than the clay body upon cooling. The crazing may be evident immediately or develop some time after firing. Other causes of crazing can be overfiring or too rapid cooling.

Shivering can be considered the opposite of crazing in that the glaze is put under compression by the clay body. The glaze may peel or flake off the surface. Shivering can be caused by a glaze composition that lacks sufficient high expansion alkali materials that contract more upon cooling causing separation.

Crawling is evident when the glaze shrinks together into islands, revealing bare areas of the clay body. The flaw may be apparent in isolated areas or the glaze may crawl entirely off the surface. The defect commonly results when the liquid glaze is applied over a dirty or greasy surface and the glaze fails to adhere adequately during firing.

Pitting in the glaze can vary in size, from pinholes to larger spots. These holes can occur in the course of a too short firing time which does not allow the gases or other volatile materials to fully escape before the glaze solidifies. Firing at a temperature too high for a particular glaze can also produce pitting. If the liquid glaze boils, pits can remain as the glaze cools.

Blistering results when air is trapped between the glaze and the clay body. These bumps are easily crushed. Glaze which is applied too thickly and already contains air bubbles will frequently blister.

2. Materials and Manufacture of Glass

Glass is a solidified liquid. A liquid is an amorphous material that does not have a crystalline structure. Most materials form a crystalline lattice during cooling from a liquid to a solid state.

The non-crystalline structure of glass results when molten glass cools quickly, while the molecular units are still disordered and do not have time to rearrange themselves into a lattice formation. The resulting material is "frozen" into a random network of molecular units.

Glass has characteristic properties of being rigid and brittle at room temperature, plastic at extremely high temperatures, and can be transparent, translucent, or opaquely colored.

a. Material Makeup and Structure

The basic composition of glass is the same as a glaze, though the proportions and particular ingredients will differ. The basis of glass is silica, often in the form of sand. Silica is fused with an alkaline oxide (known as a flux) that interacts with the silica to lower the melting temperature. These are usually oxides of lead, calcium, potassium, or sodium. The same colorants and opacifiers are used in both glass and glazes.

While glazes and enamels are true glasses, the distinction lies in specific material composition and firing temperature. Glass end-products, that are formed by casting or are mouth blown, must be made from glass that flows readily when molten. Glassy coatings must have enough body to adhere to surfaces that may be rounded, vertical, or otherwise irregular during application as well as firing. The addition of alumina to the formulation increases the stiffness of the glass. Glazes are generally fired at lower temperatures than those required for bulk glass making. Enamels can be considered glazes on metal and are fired at even lower temperatures than glazes on ceramic bodies.

b. Production Processes

A combination of hot and cold working techniques is used in glass production. In general, glass must be in its plastic condition to be shaped; therefore, various hot working techniques are used for its manufacture. The surface can be embellished by cold techniques after formation.

1) Hot shaping processes

Mouth blowing begins with gathering of molten glass that is collected at the end of a hollow pipe. The worker blows air into the pipe, either by mouth or with the help of a bellows. Shaping is accomplished with metal tools (e.g., shears or rods). Molten glass can also be blown to fill a metal, stone, or wooden mold. The two methods can be combined. A mold blown piece can be further shaped after it is removed from the mold.

Glass pressing is molten glass pressed into a mold with a metal tool. After the 19th century, this technology allowed for increased production, making glassware widely available.

Pressed and molded glass can sometimes be identified by mold lines, though these lines are often ground and polished away.

Core dipping or winding is a process by which a core of organic material (e.g., dung, straw) is mounded over the end of a rod, coated with sand or clay, and dipped into molten glass or wrapped with rods of glass. The glass is continually heated and rolled over a smooth surface to produce a homogeneous surface. The core is removed after the glass has cooled.

Less common fabrication processes that may be encountered are *pâte de verre*, lost wax casting, and *millefiore*.

Pâte de verre, literally, is glass paste. It is produced by grinding glass to a powder, mixing it with an organic adhesive to enable the mixture to be molded or modeled, much like pottery. The conglomeration is fired, burning away the organic material, and fusing the glass powder together. The resulting glass body is more opaque than transparent.

Lost wax casting is essentially the same process for molten glass as it is for molten metal. A wax model is created, covered with clay, and fired to remove the wax. Molten glass is poured into the void left by the wax.

Millefiore glass is produced when rods of different colored glass are wrapped together with layers of colored glass and heated. The package is rolled on a textured surface that gives it shape while it is worked together. The thick rods are then cut into short lengths that exhibit floral designs in cross section.

Decorative detail can be added while the glass is still molten by fusing colored glass onto the surface of the object, or by integrating colored glass threads or shapes into the body and reheating.

2) Cold working techniques

Cold working techniques are used to create decoration after the bulk body has been formed. When glass is solidified, it can be fashioned using the same methods as in stoneworking. Among the techniques most frequently seen are the following:

Cutting or engraving into the glass with a rotating abrasive wheel, such as one with diamond chips, is a common method of decoration. Glass is removed from the surface to create the design.

Chipping is a less controlled and sometimes unpredictable method of removing glass from the surface to effect a pattern. The design can be directed by engraving the outline of the design, then chipping with a sharp tool to remove the glass.

Acid etching was first used in the 19th century to decorate glassware. The surface of the vessel was coated with wax into which the design was cut. The piece was dipped in hydrofluoric acid which etched the exposed glass.

In most cases, the final step in production is to polish away any signs of roughness or imperfections using a hard and very fine textured abrasive. High quality glassware is always polished while lower quality ware may show the evidence of manufacture, such as mold lines.

3) Flaws in manufacturing

It is important to know that some flaws that develop in the glass body during production are part of the manufacturing process and are not necessarily a sign of progressive deterioration.

Bubbles that appear in the glass are often intentionally added for decorative effect. Occasionally, misplaced air bubbles may develop during the molten state. A few isolated bubbles will not have any affect on the strength of the body, though a concentration in a single area may cause that area to be weakened. The shape of bubbles can give clues about the direction the object was worked while in the molten state.

Inclusions or foreign bodies are occasionally seen, though they are more noticeable in translucent bodies. These flecks may be from contamination in the crucible or impurities in the raw materials, such as metallic bits or sand. While small inclusions may disrupt the surface and look of the object, they will not affect its strength.

Progressive deterioration does occur when there are compositional flaws in manufacturing. This condition can be immediately apparent or may not be evident for many years. An unstable composition makes the glass body more subject to deterioration prompted by environmental cycling. The symptoms of deterioration are noted in Section C, "Agents of Deterioration."

Unstable glass was commonly made during a period of glass experimentation in the 17th and 18th centuries. In the course of a search for a substitute for colorless Venetian glass, insufficient amounts of lime stabilizer were added to the composition. This caused the alkali material (e.g., potassium or sodium) to leach out, creating voids in the body.

3. Materials and Manufacture of Stone

Throughout history, civilizations have used stone to record the facts of their lives, provide shelter, and give form to their creative

urges. It is the slow and often invisible deterioration of these stone sculptures, monuments, and buildings that park staff must prevent through appropriate conservation techniques.

a. Material Makeup and Structure

Geologically speaking, rock is classified into three broad categories based on the following formation conditions: igneous rocks form when magma cools and solidifies; sedimentary rocks form by the solidification or cementing together of sediments, both mineral and organic, from solution; and metamorphic rocks form by transformation from existing rock by pressure and heat, without melting.

These classifications are further subdivided according to mineral content, exact chemical composition, grain size, and texture. Igneous rocks (e.g., granite, basalt, obsidian, porphyry) are generally hard and very stable because of their interlocked crystalline structure. Sedimentary rocks (e.g., sandstone, limestone, alabaster, travertine) composed of consolidated layers of disintegrated material are usually more permeable and exhibit a more rapid rate of deterioration than igneous rock. Limestone, a common building material is particularly pervious. Metamorphic rocks (e.g., marble, quartzite, slate, soapstone) have an altered crystalline structure depending on the parent rock. Marble is probably the most frequently encountered stone material in National Park Service collections. As a result of the metamorphosis of limestone, marble is formed of densely packed crystals having reduced pore space and size.

The durability of stone depends on its porosity, permeability, hardness, mineral content, and amount and type of inclusions. Porosity is the percentage of free space in a rock, and permeability is the capacity of a rock to allow fluids to pass through it. Degree of hardness can be measured using the Mohs Scale. This scale employs ten standard minerals of increasing hardness against which the unknown is compared. Hardness is assigned according to the numbered mineral which will scratch the unknown. Naturally, the harder the stone used in the production of the artifact, the less likely it will incur scratches or abrasions from handling or wind-born grit.

b. Production Processes

Stone working tools and techniques have changed little to the present day with the exception of electrically powered tools and cutting devices. Originally fashioned from stone, the basic cutting tools improved with the development of metals, especially steel, but the simple, proven shapes remained the same. Heavier and thicker tools are required for carving hard, igneous stones (e.g., granite) than those used for the limestones and marble.

Tempering, the process of hardening steel tools by heating, cooling, and slow warming, is also necessary for the tools used on hard stones.

Often, fine polishing has removed most traces of tool marks from the surface of a sculpture, but unviewed back surfaces or inaccessible undercuts are valuable for tracing the hand of the sculptor. Six basic tools are generally employed by the sculptor: point, tooth chisel, flat chisel, bushhammer, abrasives (tools or grits), and drill. While the carving tool is held lightly in one hand, the other hand wields a hammer or mallet which is used to strike the end of the point or chisel. The tool is guided by the thumb as it cuts through the stone by the force of the hammer's blow.

1) Traditional Carving Tools

Point (Punch)

After selecting a stone, the point is used for roughing-out the shape from the block. Large masses of stone can be removed with the point, progressing from larger to smaller diameter points. On rare occasions, an entire sculpture has been worked with only the point. In use, the point is held at an oblique angle to the stone surface and hit with a hammer.

Tooth Chisel (Claw Chisel)

Following the initial roughing-out with the point, the tooth chisel is used to remove more layers of stone while further defining the form. The carving progresses using a coarse chisel with well-spaced teeth and graduating to a fine chisel having numerous closely spaced teeth. While using the tooth chisel, sculptors carefully follow the contours of the form and the teeth marks will appear in several different directions. At this point the stone has a raked or combed appearance.

Bushhammer

While the tooth chisel is primarily used on limestones, sandstones, and marbles, the bushhammer replaces it when working on granite and hard igneous stones. The bushhammer, basically a series of points or teeth in one head (multi-pick), is useful for wearing down or pulverizing a hard stone surface. Similar to work with the tooth chisel, the sculptor progresses from coarser to finer toothed bushhammers. A stone worked with a bushhammer has a pitted, granular appearance.

Flat Chisel

The marks of the tooth chisel and bushhammer are usually removed with a flat chisel. In use, the flat chisel is held almost parallel to the surface of the stone as it cuts across

and removes material. A rounded edge to the flat chisel is useful for concave surfaces, otherwise a square, sharp cutting edge is employed. Although primarily a surface finishing tool for sandstones, limestones, and marble, the flat chisel may be used solely in the carving of some soft stones or when producing low relief carvings.

Abrasives

Once the sculpture is prepared with the flat chisel, final finishing and polishing proceeds. However, some finished sculptures may purposefully be left with a very textured surface. Rasps, rifflers, and files are examples of abrasive tools. As with wood and plaster, these tools are used to wear down the surface of the stone. Mineral and stone abrasives, in a finely ground state or as a solid block of material, are used primarily for cutting, smoothing, and polishing. Sandstone, pumice, and carborundum (silicon carbide) are used as abrasives, frequently for shaping and smoothing. Emery cloth, solid tin oxide, and sandpapers are used for finishing stone surfaces. Finally, whiting is used during polishing. Of course, use and order of these abrasives is interchangeable and the finishing can be stopped at any point by the sculptor.

Drill

The star drill is a metallic tool with a star head that is slowly revolved between the fingers while being struck with a hammer. A bow drill consists of a round headed tool held in a stationary handle with a rotating drum. The drum is rotated by either a bow and its cord wrapped around the drum or by another worker using a cord.

Stone splitting is accomplished by first drilling a series of holes along the line of the stone face to be split, inserting wedges into the holes, and hammering. A line of parallel vertical marks from the drill can be seen on the stone after splitting.

2) Ancient Tools and Techniques

Stone tools recovered from archeological sites were produced using flaking methods. Flint, obsidian, and chert were the favored stones because they flaked easily and gave a sharp edge when fractured.

There are two basic methods for detaching a flake: by percussion flaking, striking the core or parent block usually with or against another stone, or by pressure flaking, applying heavy pressure at a point with a stone, bone, or wood tool. The fracture face, known as conchoidal fracture, shows a series of concentric arcs radiating from the point of impact.

Additionally, a flake usually exhibits a bulb of percussion, or swelling below the point of impact due to compression.

Evidence of primary flaking, the initial roughing out, and secondary flaking, often seen as edge trimming, may be visible on ancient stone tools. Cutting, drilling, and abrading were also carried out using sand as the abrasive together with wood, bone, stone, or early metal tools.

3) Contemporary Techniques

As previously mentioned, contemporary sculptors employ the same basic tools that have been used by stone carvers throughout history. In addition, cutting techniques have been facilitated through the use of wire saws, diamond saws, and flame-cutting.

Pneumatic equipment basically decreases the time and lightens the labor of stone carving and is especially useful when working the hard, igneous stones such as granite. Compressed air is used to supply the force of the blow. The pneumatic drill or air hammer can be fitted with a number of chisels for delicate or rough carving.

4) Mechanical Processes

Pointing is a mechanical process for duplicating an original model into stone. A pointing machine, a movable instrument with adjustable rods, mechanically measures a number of points on the original and transfers these to the stone block. Holes are drilled into the stone corresponding to the point and depth measured with the pointing machine. The stone between the drilled holes is then chiseled away. Finer pointing is employed as the reproduction progresses.

Reducing from a larger model and enlarging from a smaller one can also be achieved with mechanical aids.

C. AGENTS OF DETERIORATION

By far, the greatest amount of damage to ceramics, glass, and stone results from mishandling and accidental breakage. While these inorganic materials have generally good chemical resistance, inherent chemical instabilities may exist that can make some ware vulnerable to heat or moisture.

1. Deterioration of Ceramics

Ceramics can be affected by lengthy and cyclic exposure to moisture and heat. Porous ceramics may be weakened when water is drawn into the body and dissolves salts or other organic matter. The migration of material leaves voids in the body and can push through to the surface. Glazes can develop the same degraded conditions as glass, such as crazing or crizzling, which leaves the surface with a cloudy appearance.

2. Deterioration of Glass

Glass is subject to corrosion by water. The following distinct conditions signal the irreversible deterioration of glass material: **crizzling, weeping, iridescence, efflorescence, and devitrification**. These related conditions involve the migration of components within the glass body to the surface that encourages the attack of water and subsequent deterioration of the chemical structure. Each state is part of the cycle of decomposition that progresses with fluctuations in relative humidity.

- a. **Crizzling** is the very fine network of cracks that turns the glass from transparent to translucent. An unbalanced glass composition that has too little of the stabilizer lime (less than 4%), enables alkali components such as potassium or sodium to leach out. Hydrogen from atmospheric water replaces some of the missing alkali. The extensive loss of alkali can greatly weaken the glass structure.
- b. **Weeping** is considered the wet stage of the deterioration cycle in which the leaching sodium or potassium combines with moisture. Sodium or potassium hydroxide is formed and accumulates on the surface of the glass. It often has a greasy feel and may be referred to as "sweating" glass. The condition can be compounded when the hydroxide continues to react with the atmosphere and forms very hygroscopic carbonates.
- c. **Iridescence** is seen in the colorful layers that appear on the surface of glass. The phenomenon is actually due to a thin film interference, much like that seen in oil slicks. The layers are formed when the alkalis leach from the glass composition and combine with moisture. The strong chemical bond creates a permanent hygroscopic film that continues to attract water from the air. The hydrated alkali layer eventually separates from the

original surface exposing intact glass surfaces. As the cycle progresses, other layers begin to delaminate.

- d. **Efflorescence**, in its extreme state, appears as a mass of fluffy white crystals on the surface. This is known to occur on glass trade beads sewn to leather skins. The beads weaken as the alkali components are attracted to the moisture on the surface, eventually breaking apart.
- e. **Devitrification** occurs when the glass changes from the glassy to the crystalline state. It can be considered a flaw or with controlled production, an intentional effect. Intentional crystallization gives the glass good thermal shock resistance. Unintentional devitrification indicates an unbalanced glass composition, (too little alumina or too much calcium), or that the mixture cooled too slowly, or a combination of both conditions.

3. Deterioration of Stone

a. Outdoor Environment

The outdoor environment is generally much more aggressive to stone objects than an indoor one. Although the same types of degradation can occur indoors, the reaction times will be much slower and often more difficult to monitor. Therefore, deteriorating agents outside the museum are discussed first but it should be considered that a micro-environment inside the museum can induce similar damage to a stone.

1) Water

Water is the primary deteriorating agent of stone in the outdoor environment. Because water increases approximately 9% in volume upon freezing, yearly freeze-thaw cycles cause cracking, splitting, and spalling. Continual penetration of sedimentary rocks tends to cause separation of the layers. Soluble salts, such as chlorides, are carried into the stone by water and on drying can crystallize on the surface as efflorescence or below the surface and cause spalling or surface delamination. Water also acts as a solvent for pollutants from air or rain, discussed below.

2) Atmospheric Pollutants

Carbon dioxide reacts with water to form carbonic acid that dissolves calcium carbonate, the chief component of limestone and marble. Chlorides and nitrates hydrolyze to form hydrochloric and nitric acids, that are very corrosive to stone. Sulfur dioxide and sulfur trioxide, in the presence of water have a double aggressive action. They can hydrolyze to form sulfurous and sulfuric acids that attack calcium carbonate. Soot from burning hydrocarbons and free sulfur interact to convert carbonates into disfiguring brown or black

sulfate layers on the surface commonly referred to as "black crust." It has been calculated that urban rain dissolves an exposed surface of calcium carbonate at least fifty times faster than unpolluted rain, and can be as much as over one hundred times faster.¹

3) Biological Agents

Algal, fungal, and moss growth on a stone's surface and inside cracks, retain water and contribute to the deleterious problems described above. The organic acid waste products from the alga-fungus metabolism dissolve calcium carbonate and can leave a marble surface badly pitted and susceptible to further attack. Micro-organisms also produce a variety of dark stains on stone. Disfigurement can also be caused by pigeons and other birds.

4) Windborne Materials

Soot, containing unburnt tarry particles, adheres to stone and discolors the surface. Wind driven sand, gravel, and particulates tend to remove deterioration products and weathering crusts from a stone's surface and contribute to its erosion.

5) Metallic Inclusions

Colored compounds can migrate into certain stones creating much disfigurement. This is especially problematic on sites where metals, such as commemorative plaques and reliefs or sculpture are mounted onto stone or used as interior stone supports. Copper corrosion products cause green stains and iron rust produces brown stains. In addition to staining, internally placed iron pins can cause a stone sculpture to crack by the added volume of rust. Some restoration solutions used on mounted metals can also stain the stone supports and bases.

b. Indoor Environment

1) Dirt

Because of wide variations in texture and surface finish, dirt tends to collect in localized areas as well as on horizontal planes of sculptures. The more traffic inside a museum and the less air filtration, the greater the accumulation of dirt!

2) Stains

Oils from repeated handling and previous restoration eventually crosslink and discolor with age and become especially noticeable on lighter stones. Adhesives and coatings such as shellac and wax darken over time and give the stone a blotchy appearance.

3) People

Museum visitors are probably the greatest agents of deterioration indoors, handling marks and breakage being the most obvious results. Graffiti, paint smears, and liquid attacks are more examples of deterioration caused by human contact. Inks, lipsticks, and paints can enter the pores of the stone and become very difficult to remove. Strong acids and bases will readily etch the surface and remove the polish.

4) Water

Water acts as a deteriorating agent indoors when the relative humidity is not controlled and enough moisture is present to react with salts, pollutants, or metallic inclusions to cause the various types of damage described above for outdoor settings.

5) Change from Outdoor to Indoor Environment

When exterior sculpture is moved into a museum environment, deterioration may be accelerated. Pollutants, biological matter, cleaning agents, and especially soluble salts, may leave residues within the stone that were once washed away by rain. In the new interior environment, large salt crystals may form on the sculpture. It may become covered with mold or metallic stains and it may even begin to spall.

D. PREVENTIVE CONSERVATION

1. Handling of Ceramics, Glass, and Stone Objects

Refer to Chapter 6 for general rules on handling museum objects. When moving objects, plan the most direct route possible with no stops along the way. Do not combine tasks. Make certain that the pathway is clear of potential hazards. When moving through public spaces, use an "advance" person to clear people or objects from the path. Frequent handling can be eliminated through the use of good quality photographs for each object. A complete set of both overall and detail photographs can provide much of the information that necessitates handling. Some specific rules that apply to the handling of ceramic, glass, and stone objects follow:

Ceramics and Glass:

- a. Handle glass and ceramic objects as little as possible.
- b. Before handling, examine the object carefully to note any unstable repairs, loose parts, lifting glaze, hairline cracks, or vulnerable appendages.
- c. Do not wear cotton gloves to handle glass or ceramics because the surfaces are slippery. Remove jewelry such as rings, bracelets, and long necklaces that might scratch or chip the objects. Be sure hands are clean and dry before touching objects.

Be careful not to touch with bare hands the surfaces of lustre ware, iridescent glasses (both intentionally treated and those with deterioration products), and gilded ceramics and glass. The moisture, oils, and acids left from fingerprints will disrupt and eventually etch these delicate surfaces. Use snug fitting latex gloves when handling these objects.

- d. Use both hands to support the object uniformly when moving it. Do not lift by handles, knobs, rims, or decorative motifs. Never push an object to the side to gain access to another object.
- e. Transport the objects in a padded basket or tray without crowding. When moving numerous or large objects, use a well balanced and padded cart.
- f. Transport any detachable parts separately, such as lids or bases. If there are loose (but not removable) parts, slip tissue or padding between them to prevent rubbing or chattering.
- g. Take care to place objects so they do not touch each other during transport. Use plenty of soft tissue or diapers around each piece to prevent them from rolling, tipping, or rubbing against each other. Do not move stacked glasses or plates.

- h. Carry thin flat objects, such as securely attached mirrors or panes of glass, in a vertical position in order to distribute the strain of the weight and to minimize the possibility of cracking. The use of a dolly or hand truck is acceptable if it has soft plastic or rubber wheels and the surfaces are adequately cushioned. Plastic or rubber wheels and cushioned surfaces serve to reduce shock and vibrations from bumps in the floor.
- i. Never apply cellophane tape or sticky labels to ceramic or glass objects. Delicate overglazes, decals, and gilding are especially sensitive. Do not remove any labels that are already attached.

Stone Objects:

- a. Hands should be clean and clean white gloves worn as well.
- b. Always be careful where hands are placed: paint, gold leaf, and delicately carved areas are easily knocked off; previously repaired areas may not be as stable as the undamaged stone.
- c. Size and weight may be deceiving. Always carry one item at a time and never lift by any projecting parts such as arms, legs, or wings.
- d. A cart should be used when moving an object for more than a very short distance or when moving more than one object. Have a supply of protective pads, wedges, or blankets to stabilize objects on carts and to prevent them from abrading each other.
- e. If large numbers of small stone objects are continuously being moved at the same time, carts and trays should have built in padded dividers or molded separators. Placement in polyethylene bags or museum specimen trays will also eliminate edge damage and scratching during movement of small stone objects.
- f. Large and heavy sculptures may require a forklift. Sufficient personnel must be available to secure a sculpture on a pallet that is being lifted.

If straps or chains must be temporarily wrapped around the sculpture, make sure they are well padded and cannot slip off the pads to scratch or mark the stone surface. Again, be especially aware of projecting parts when lifting a sculpture by hoist.

- g. Know where you are going and where you plan to put an object before lifting.
- h. Careless handling of ladders, scaffolding, maintenance equipment, and paint can cause irreparable damage to stone sculpture.

2. Environment for Ceramic, Glass, and Stone Objects

To the extent possible, materials that respond to temperature and humidity in a similar manner should be stored and exhibited together. Regardless of how durable an object appears to be, all environmental conditions should be equally stable. Every effort must be made to ensure that the temperature and humidity are maintained within a fairly narrow range. Ideally, fluctuations should not exceed $\pm 3\%$ relative humidity in a month. Any inevitable fluctuations (e.g., daily or seasonal) should be controlled as much as possible.

Recommended levels for relative humidity and temperature are noted below. In those climates where these levels may be difficult to maintain, environmental ranges must be established on an individual basis.

- a. Low-fire ceramics and stone can be considered together when planning their storage and exhibition. These materials, if in stable and unadulterated condition, present relatively few problems when compared to more sensitive organic materials. A stable interior environment, appropriate for staff or visitors and relatively free from atmospheric pollutants is acceptable. Recommended environmental levels for storage of low-fire ceramics and stone are as follows:

Temperature range: 55-75°F
Relative Humidity range: 40-60%

It is important to keep the relative humidity below 65% to avoid mold growth.

- b. High-fire ceramics and glass have similar physical characteristics and will react to the environment in a comparable manner. These materials are more crystalline in structure and do not accept environmental changes as easily as more porous material. In addition, objects that appear to be sturdy can be deceiving. Potential instability is often difficult to detect readily. Initial stages of deterioration are accelerated by high temperature and humidity levels, and are exacerbated by cycles of change. For these reasons, the storage environment must be maintained in more narrow ranges than for low-fire ware. Recommended environmental levels for storage of stable high-fire ceramics and glass are as follows:

Temperature range: 45-55°F
Relative Humidity range: 45-55%

- c. Glass objects that show deterioration, such as weeping, cloudiness, or iridescence, or that are suspected of being unstable, should be separated from the collections to await a conservator's examination and treatment. It is essential that these objects be stored in a firmly controlled environment, such as a conditioned vitrine or museum specimen cabinet. Recommended

environmental levels for storage of unstable high-fire ceramics and glass are as follows:

Temperature: maintained at 62°F ($\pm 2^\circ$)
Relative humidity: 40% ($\pm 3\%$) (Higher RH causes the salts to solubilize and migrate.
Lower RH will cause cracking).

- d. Stone artifacts framed in wood should have the same environment acceptable for wood. Refer to Appendix N for acceptable environmental levels for wooden objects. Otherwise, dimensional change in the wood caused by fluctuations in relative humidity and temperature could produce cracks in the stone. If there is polychrome on stone, continual or rapid changes in relative humidity can cause the paint to become brittle, crack, and eventually flake off.
- e. Light levels do not present a problem unless there are polychrome stone sculptures or ceramics in the collection, in which case light levels should not exceed 50 lux. The ultraviolet radiation component should be filtered.

3. Storage of Ceramic, Glass, and Stone Objects

From a preservation standpoint, collections that can be stored according to their sensitivity to the environment are at an advantage. The primary objective in the storage of brittle objects (e.g., glass and ceramics) is to minimize handling, thus the potential of breakage. Design the storage area so that access is safe, simple, and direct. Refer to Chapter 7 for guidance on the storage of museum objects.

Glass and Ceramics:

- a. The storage area should be in a low traffic part of the site, away from public access.
- b. Store ceramics and glass on stationary shelving units. Shelving units are safer for ceramics and glass than movable drawers. The shelves should be lined with a non-slip material such as Volara® sheets (closed cell polyethylene foam) that is firmly attached so it will not bubble up or slide out. Refer to Section J of this appendix for a source for Volara®.
- c. Closed museum cabinets with clear glass doors allow visual inspection of the contents without handling. (Refer to the NPS Tools of the Trade for information on these cabinets.) Units with doors containing gaskets and smooth-working mechanisms will minimize dust accumulations.
- d. The shelves should be only deep enough to accommodate a single object to discourage the need to move objects to retrieve others.

Place small objects in rows with ample space around them for ease in handling.

- e. Store the heaviest objects on the lowest shelves.
- f. If at all possible, do not stack plates, cups, or bowls. If it is necessary due to a critical lack of space, place generous sized sheets of soft fabric (e.g., cotton flannel) or thin polyethylene foam between each object. Make sure the objects nest well (e.g., as matching dinnerware) and do not put any pressure on each other. Do not overstack.
- g. Objects that are unsteady due to damage or that are top-heavy should be stored in the most stable configuration possible with the help of padding or cut foam blocks. Refer to Figure P.1 for an illustration of a technique for stabilizing objects in storage.
- h. Shelves should not be so high as to require the use of a stepladder.
- i. Open shelving units should have a close-fitting dust barrier over the front, such as continuous clear polyethylene sheeting or fabric. If oversized objects must be stored in the open, they should be individually wrapped or bagged to protect them from dust.

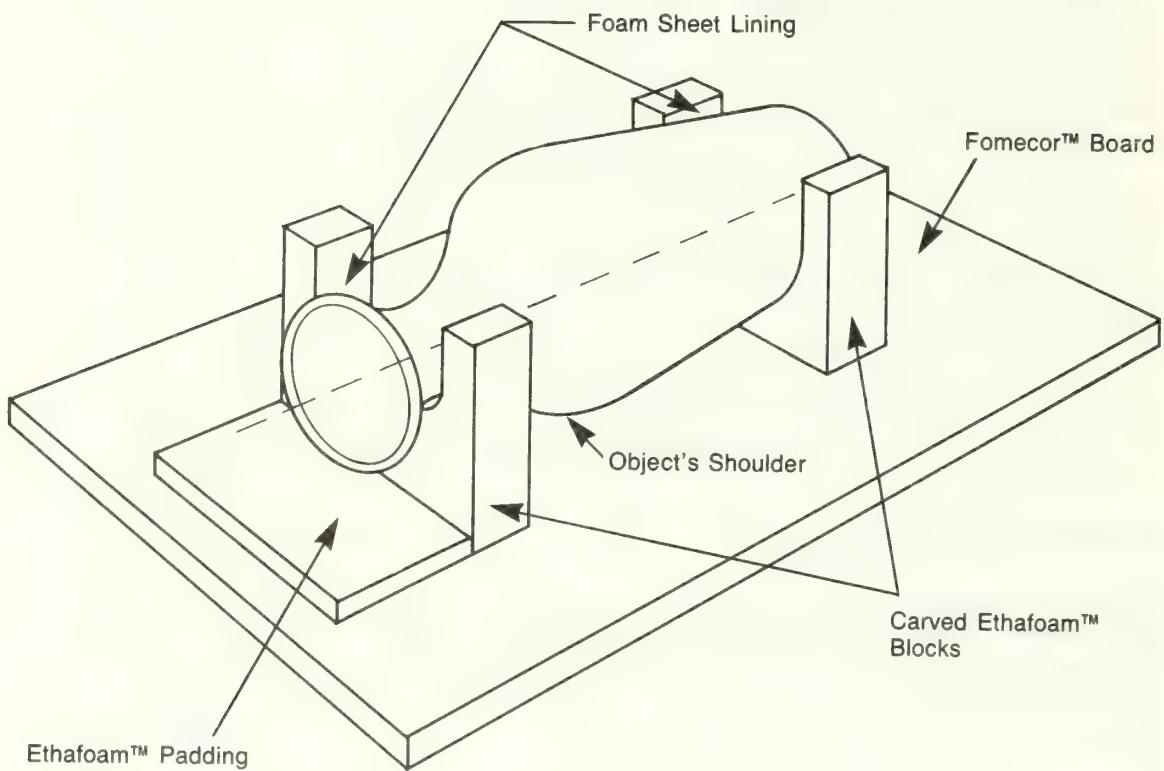
Unstable Glass and Ceramics:

Chemically unstable glass and ceramics must be stored in a closed, space that provides constant temperature and relative humidity. An airtight container such as a fishtank with plate glass across the top can be maintained at approximately 40% relative humidity by using silica gel or a saturated salt solution.

Silica gel- Place oven dried silica gel at the bottom of the tank along with a hygrometer to measure the relative humidity. Mist water over the silica gel until the RH registers about 40%.

Saturated salt solution- A saturated salt solution made from zinc nitrate crystals (Refer to Section J Source List) and water will maintain an atmosphere of 42% RH at 68°F. When an excess of crystals is added to water and will no longer dissolve, the solution is considered to be saturated. This solution is placed in the bottom of the tank.

With either method the object needs to be placed above the bottom of the container. Support the object on a sturdy, stable, perforated plastic platform over the silica gel or salt solution. A dial hygrometer or RH indicator strip should be placed in the tank to monitor the humidity level. To ensure that the tank is airtight, petroleum jelly must be applied over the rim of the tank before the plate glass is laid across the top.



A top heavy or damaged object can be stored in a Ethafoam™ cradle.

Lay the object on its side, supported so it is level. Measure the curve of the base and the neck with a flexible drafting curve. Cut each curve into a 1" – 2" thick Ethafoam™ block. Use a long knife (e.g., bread knife) with a fine serrated edge. Thickness depends on the size of the object.

The placement of the curve on the block should allow the shoulder of the object to touch, not rest heavily, on the mat.

Padding or a thickness of Ethafoam™ should be placed underneath any projecting part of the object (such as the rim) as a barrier against bumping.

Cut thin foam sheet for lining the cradle surfaces.

The foam blocks can be free standing or fixed to a Fomecor™ board so that each cradle is portable.

Figure P.1. Method of Stabilizing Objects in Storage

Stone:

- a. Dirt and dust can accumulate within the pores of stone and darken the surface. Whenever possible, keep the stone covered to avoid unnecessary dust accumulation. In storage, polyethylene sheeting or bags can be lightly placed over stone objects for protection from falling dust and debris.
- b. Placement of objects near open windows, air conditioning vents, or heat sources should be avoided.
- c. Small stone objects such as arrowheads or beads may be stored in drawers or trays on shelving units. Padded dividers will prevent the small items from slipping onto each other and possibly causing scratches or breaks when a drawer is opened or the tray lifted. Standard plastic or wooden boxes with dividers are also useful for small items. A cover of tissue or polyethylene sheeting will protect an open tray from dust. Ideally, drawers or dedicated trays should be lined with a stable foam; such products are, Volara®, an expanded, closed-cell polyethylene foam which has been cross linked or Ethafoam®, an expanded, closed-cell polyethylene foam. Individual shapes are then cut in the foam liners to accommodate the specific object. Accession information can be written directly on the foam in a standard location around the object's cut-out. These lined drawers are also useful for study purposes, since it is likely that the object will be returned to its proper housing.
- d. Because of their size and weight, large stone objects such as reliefs, busts, and statuary present problems. Well supported metal shelving is necessary to accept the weight of the stone objects. Shelves should be lined with a non-compressible material such as carpet pads or stable, closed-cell polyethylene foam. Do not use polyurethane (ester or ether variety) foams because aged polyurethane foams disintegrate and crumble on the stone.
- e. Store heavier objects on lower shelves to lower the center of gravity and minimize the danger of a rack toppling over.
- f. Do not allow parts of an object to protrude beyond the edge of shelving where they might get bumped.
- g. Avoid storing a sculpture directly on the floor where it can be kicked and marred or subjected to floor maintenance materials.
- h. A low deck in one area of the storage space is ideal for keeping sculptures off the floor.
- i. Sufficient space should be maintained between objects to prevent accidental bumping and to enable periodic inspection. Overcrowding of these large objects must be avoided to prevent conditions conducive to accidents. Pedestals and pallets can also be used for storing statuary.

- j. If a heavy piece is likely to be moved within a short period of time, it is useful to store it directly on a dolly to minimize excess handling.
- k. A number of measures can be taken to safeguard collections in storage from total loss during an earthquake. Shelves and cabinets should be securely bolted to walls and floors. Restraining bars and elastic strips attached to the edges of shelves will prevent objects from flying off the shelf and toppling over. Overhead lights, pipes, and ductwork should also have reinforcing attachments to the ceiling².

4. Exhibition of Ceramics, Glass, and Stone Objects

- a. Glass and ceramics on exhibition should be securely mounted so that if the case or pedestal is bumped, they will not be knocked over readily. Acceptable mounts include freestanding or wall mounted metal wire brackets or stands made from clear plastic sheet (e.g., Plexiglas). Mounts must be padded where the metal touches the object. Flexible plastic tubing or felt over the ends of the wire will prevent scratches.
- b. Light in exhibit cases should be cast evenly. Do not direct spotlights on individual objects. Spotlighting can induce thermal shock as well as raise the temperature of the case.
- c. Because of size and relative stability, statuary is usually exhibited without a case or vitrine and is vulnerable to touching, vandalism, and breakage. Therefore, it is necessary to provide a physical barrier or separator between visitor and object. Individual pedestals or a continuous deck to accommodate a number of sculptures are useful. The pedestal should be sufficiently high or significantly larger than the object so it cannot be easily climbed on in an attempt to reach the work of art.
- d. Busts and smaller stone objects must be securely mounted to prevent pushing or toppling over. These techniques can include: a dowel from the object into the pedestal, a niche in the pedestal to contain the base of the object, and straps or other added armature for fastening the object to a supporting structure. A padded separator should be used between the stone and any metallic support to avoid scratching or abrasion of the surface. Metal clips should be checked periodically to ensure that they have not bent and are adequately supporting the mounted stone object. Mounting height should prevent easy access to delicately carved areas or tempting projecting appendages.

Stone reliefs should not be plastered directly into the wall for two reasons: difficulty of later removal and transferral of rising damp or soluble material directly from the walls into the stone. Similarly, cement bedding is not recommended due to the large quantity of water in the cement that will be sucked into the

stone carrying with it soluble alkalis. The water can also activate salts inside the stone which formerly may not have been of consequence. A damp proof membrane (e.g., lead, bitumen, Teflon[®]) is necessary to protect a stone sculpture that is placed on a concrete pedestal or floor, or when placed in direct contact with an outside wall. The membrane serves to protect the object from water soluble contaminants that may be present in the concrete.

- e. Stone objects on exhibition should be kept free of dust. One should never use a cloth for dry cleaning as this might rub the dirt into the surface. Only use a soft brush. Dust can be swept directly into a vacuum cleaner or collected by vacuum cleaner immediately afterward.
- f. Exterior stone sculpture and monuments are not exhibited in an ideal environment and therefore should be carefully monitored for alterations. By conducting an annual condition survey of the work of art, and comparing the present state with detailed photographs, the park curator should be able to pinpoint problematic areas and any detrimental changes to the stone. In unusually corrosive environments, the stone should be brought inside and a replica placed outdoors.³
- g. It is important to consider potential seismic activity in the area when designing mounting systems for stone artifacts, standing sculpture, in particular. A sculpture can be protected from horizontal displacement during an earthquake by mounting it on an isolation base which allows the floor to move while the object in essence stands still. Ball bearings and centering devices enable the base to move within a specific radius without transferring a dynamic load onto the sculpture. Foam with high shock absorbancy can be used to protect a mounted sculpture from vertical movement.⁴

E. CARE OF COMPOSITE CERAMIC AND GLASS OBJECTS

Composite ceramic and glass objects found in park collections include mirrors, chandeliers, and mounted objects. Examine each object closely. It is essential to identify its different materials (e.g., glass/ceramic and metal, wood, gilding) as well as its method of assembly (e.g., where are the movable parts, what areas bear the weight, and how is the object installed) in order to plan appropriate handling and storage.

1. Framed Mirrors

a. Inspection

Inspect the mirror to see how solidly it is attached to the frame. Check the condition of the frame. Are the frame sections securely joined? Are the decorative motifs and gilding well intact? What parts are safe to handle when lifting the mirror? Is the mounting or hanging method adequate?

Examine the mirror carefully. Are there any breaks or chips in the glass? Is the glass sticky or does it have an overall network of very fine cracks (which means that it is deteriorating)? Is the coating on the back still reflective or are there black spots and streaks that indicate that it is deteriorating or peeling?

Look closely through the front of the glass to see if any silver colored droplets or beads have formed on the back of the glass. Before the 19th century, mirrors were made reflective with a mercury/tin amalgam. This coating can break down and return to the liquid state. Droplets may collect at the bottom of the frame. Be extremely careful if the reflective coating appears to be unstable. Check the immediate area for any loose mercury droplets. Wear disposable latex gloves when handling mirrors. Store the mirror separately from the rest of the collection. Contact a conservator to thoroughly examine an unstable mirror.

b. Storage and Exhibition

The ideal method to store framed mirrors is face up on well-padded shelves. Make sure that the weight of the object is not resting on a few pieces of hardware (e.g., screw eyes) or on the glass. Alleviate some of the weight of the frame from the glass by supporting the edges of the frame with padding. Heavy mirrors should be stored flat.

To hang a mirror for exhibition (or if it must be stored in a hanging position), be sure that the glass is very well attached to the frame and that the hanging device is sufficient to carry the weight of the piece. When hanging a small mirror by braided picture wire, use two picture hooks rather than one so that the weight on the wire is evenly distributed (See Appendix L: Curatorial Care of Paintings, Figure L.1.).

Heavy mirrors need more substantial support. A flush mount system of interlocking beveled wooden or metal slats will bear more weight than picture wire. One slat is attached across the back of the mirror and the corresponding slat is attached to the wall. Refer to Figure P.2 for an illustration of a flush mount for hanging heavy mirrors.

c. Cleaning

Gilded surfaces can be dusted with a soft artist's brush (see Source List in Section J) if the gilding is intact. Cleaning should be performed by a professional conservator. The glass face of a mirror in good condition can be cleaned with a water dampened cloth if necessary. Lay the mirror on a pad on the floor or a sturdy table. Before wiping the front of the glass, make sure that the back of the glass is fully supported. Keep the damp cloth well away from the frame so moisture will not be drawn underneath. Dry the glass with a soft cloth.

2. Chandeliers

a. Inspection

Each chandelier should be thoroughly examined to get a clear idea of which parts are fixed and which are free to move: how secure are the hooks and joins? and are there any missing prisms or parts? Overall and detailed black and white photographs should be taken to record where each piece is attached.

b. Storage

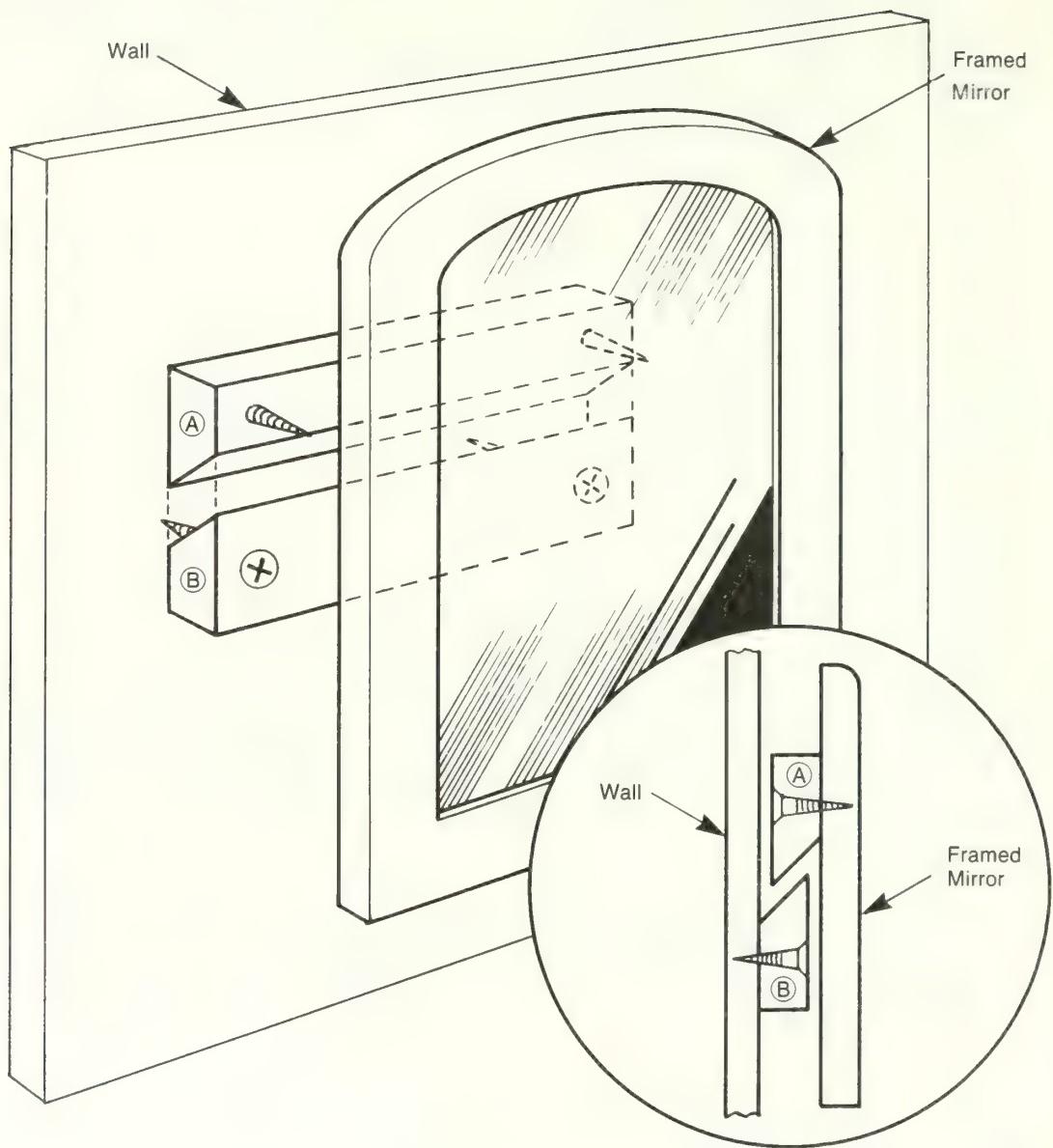
During periods when a chandelier is not actively on view or is in storage, it should be cleaned then and covered with a fabric or plastic bag to keep it dust free.

c. Cleaning

Chandeliers on view should be dusted periodically to prevent dust build-up and the need for comprehensive cleaning. When cleaning in situ, use a scaffold so that there is enough room to maneuver and both hands are free. Steady each prism or movable part while dusting so that they do not bump into one another. A professional conservator should be consulted if more extensive cleaning is necessary.

3. Mounted Glass and Ceramics

Examine mounted objects to see how securely the mounts are held to the glass or ceramic. Ormolu (gilded metal) mounts are often made up of several interlocking parts, which may loosen and rub against the



Place the mirror face down on a padded surface. Use additional padding in the flat and recessed areas to relieve any pressure on ornately carved areas.

Measure the width across the back of the frame, approximately one-third down from the top.

Locate a point on each side of the frame back into which the mounting board can be safely attached.

Cut a rectangular clear pine board (e.g. 1" thick x 4" wide, though the actual dimensions depend upon the size and weight of the mirror) to the width of the frame back. Cut the board along the grain at a 45° angle to the edge. Paint all wood surfaces with one coat of two-component epoxy paint.

Screw Part (A) into the back of the frame and Part (B) into the wall.

Figure P.2. Flush Mount for Hanging Heavy Mirrors

ceramic. Glass and ceramic objects that are combined with other materials such as metal, wood, or stone should never be cleaned with aqueous solutions. Water can seep between the mount and the object. Consult a conservator about cleaning these materials. Exhibited objects should be dusted as needed. Objects in storage should be kept as dust-free as possible.

F. CERAMIC, GLASS, AND STONE OBJECT CONSERVATION ISSUES

The following discussion provides an idea of some of the treatment issues in ceramic, glass, and stone conservation. Treatments should be carried out by a conservator or in some instances, such as washing, by other individuals trained or supervised by a conservator. These issues are briefly discussed in this section in general with no specific guidelines, in order to acquaint the park curatorial staff with the problems and to assist them in evaluating a conservator's treatment proposal.

1. Cleaning

Certain straightforward treatment such as surface cleaning can be carried out by curatorial staff trained or supervised by a conservator.

To avoid large cleaning projects in the future, both exhibited and stored objects should be dusted periodically. If the collection is stored in a relatively dust and traffic-free environment, then dusting as needed will suffice. Do not dust in situ. The dust will not be removed, merely moved around and it is more likely that damage will occur. Move the objects to a separate area to be dusted. A workspace should be prepared by covering a table or countertop with mattress padding. Move only as many objects to the workspace as can be safely dealt with at one time. There should be ample room for the objects.

a. Ceramic and Glass Objects

There are few reasons to wash pottery or glass objects. A program of routine washing is discouraged. Often, careful dusting will remove much dirt and grime. First-hand instruction from a trained conservator will help prevent damage. There are several dangers of indiscriminate cleaning. The immersion of ceramics or glass in water can shock the structure of unstable objects. Conditions such as invisible hairline cracks, delaminating glazes, or leaching components may be provoked. Low-fire wares can be weakened when the soluble components in the body (e.g., salts or dirt) swell, migrate, and finally break through the surface, causing the glaze to spall.

Before considering a wet treatment, be certain that the conservator has determined that:

- the ceramic body is actually fired;
- the body is fired sufficiently and is intact;
- the surfaces are actually glazed (or glass) and there are no painted plaster repairs (see next paragraph);
- all repaired areas are secure;
- the glazed or glass surfaces are not powdery, sticky, or crackled;
- there are no existing stains that might migrate or increase.

If any of these conditions cannot be met, then wet cleaning is not recommended.

Repaired areas can be detected by several means:

- A small magnifying glass used in good daylight is a convenient tool for examining surfaces of objects.
- A hand-held ultraviolet lamp will readily identify cracked glaze, nonceramic fills, adhesive lines, or painted surfaces. Surface anomalies will fluoresce different colors or not at all. Paint, plaster, and adhesive will not fluoresce; shellac will fluoresce orange.
- Test the different colored glazes in inconspicuous areas with damp cotton swabs to confirm that they are truly glazed.

b. Stone Objects

Before wet treatment, at least one test cleaning spot should be conducted in an inconspicuous area. Poultices or packs help ensure that stains are carried above and not deposited on the surface of the stone. Use of steam may enhance many of the wet treatments. If marbles require soaking (e.g., to remove soluble salts) it is preferable to use water saturated with calcium carbonate (e.g., water with marble chips). This step will eliminate any possibility of calcium carbonate leaching from the object into the water.

CAUTION: Do not clean with acids. Be aware that most commercial stone cleaners contain an acid component. Sandblasting is not recommended for cleaning stone. It can result in heavy loss of material from stone surfaces. A blasted surface may weather more rapidly because of the roughness or micro cracks induced.

Note on cleaning alabaster: Alabaster (calcium sulfate) is readily attacked by water. The polish on alabaster can be removed with one wash in water. Organic solvents can be used to remove dirt and grease.

2. Repair

Small broken glass, ceramic, and stone objects can be repaired with a variety of adhesives. Beyond a certain weight or when the structural integrity of the object is questioned, adhesives based on polyester (stone only) or epoxy resins are required. Although epoxies and polyesters are generally considered nonreversible or very difficult to remove, in these instances there is no alternative. The curator and conservator should discuss the disposition of the stone object and together select the appropriate method of repair. Polyester adhesives are made in a number of stone color choices and a range of viscosities. A thin layer of an acrylic resin used along the edges of an epoxy or polyester join may assist future attempts to reverse the repair. After dissolving the acrylic, a strong solvent or solvent

mixture can be introduced to break down the epoxy or polyester adhesive. A combination of solvent and mechanical action is usually required to reverse a polyester or epoxy join.

If broken pieces require an internal dowel for support, a non-corroding metal such as stainless steel (coated brass is also acceptable) must be used. As noted earlier, iron dowels can oxidize and cause staining or cracking on expansion. When dowelling is necessary, any original stone removed should be carefully saved and labelled for future research. A conservator will only remove original material from artifacts as a last resort.

3. Removal of Old Repairs/Disassembly of Sculpture

Old repairs can often have large overpainted areas which have discolored. Removal of the unknown materials is often extremely time consuming as it is unlikely that reversible products were utilized. Today conservators confine inpainting to the loss area only, using carefully selected materials, tested for their longevity and reversibility.

Disassembling a sculpture is a major effort and requires much consultation between curator and conservator. Usually such a radical treatment is only undertaken if a restoration is unsightly or deceptive, or original parts are discovered.

4. Consolidation of Stone

When a stone object lacks cohesion, is particularly fragile, or has loose polychrome, consolidation may be required.

Methods for effective consolidation of stone are hotly debated among stone conservators. The ideal consolidant would protect the stone from physical and chemical decay and at the same time strengthen an already deteriorated one. Outdoor stones and those brought inside from a previous exterior environment may require consolidation of a spalling surface or deep cracking. Some of the more frequently used consolidants include: lime water (saturated solution of calcium hydroxide), alkoxysilanes, silicone resins, acrylic resins, and barium hydroxide. These materials can be toxic or carcinogenic.

Because of the difficulties in finding the ideal consolidant, some conservators are now suggesting the use of a protectant which will literally protect the surface of the stone, avoiding the questions and problems of penetration. A protectant is a temporary surface coating and requires periodic renewals depending on the aggressiveness of the environment.

G. PACKING AND SHIPPING GLASS, CERAMIC AND STONE OBJECTS

Refer to Chapter 6 for general guidance on packing and shipping objects. Packing specifications for glass, ceramic, and stone objects are discussed in terms of relative size. All are fragile and should be packed in double crates, the inner box being floated in the outer crate with foam. For temporary purposes, such as shipping and packing, foams not acceptable for long term storage, including polyurethanes (polyesters) and polystyrenes (styrofoam), can be used. Polystyrene pellets (styrofoam "peanuts") should not be used for supporting objects inside a container because they can settle and subsequently cause loss of protection for the object.

1. Shipping Container

Shipping containers should be constructed of at least 3/8" thick plywood with wood battens for edge reinforcement. Additional cross battens should be placed on all large faces of the crate. A polyethylene liner will provide a moisture barrier. Lids should be sealed with a gasket and secured to the crate with captive screws.

2. Shipping Container's Interior

a. Small Objects

Small objects should be packed in an inner box constructed of plywood with appropriate reinforcement. This inner box can be a true six-sided box or a stack of trays. When using trays, the top-most one must have a lid. Objects should be packed within the inner box or tray in contoured foam. (Ethafoam® is easier to cut than styrofoam and does not produce the same residues.) The foam may be cut roughly to shape and the gaps filled with tissue to save labor. Avoid pressure on any fragile projections of the object.

Multiple objects can be packed in a single inner box, however, each object must be separated from the others by having an individually contoured niche cut in the foam, or, in the case of lightweight objects, its own small box. Objects should be isolated from the foam with soft tissue. Acid-free tissue is not necessary. Some tissues buffered with powdered calcium carbonate may be slightly abrasive to gilded ceramics or painted objects. Cotton flannel may be used. Objects with extremely delicate surfaces and appendages (e.g., painted ceramics or Santos figures) require special attention. In order to prevent loss of body or decoration, long strips of soft tissue should be closely wrapped around the object. Unsupported areas should be loosely fitted with soft tissue prior to overall wrapping. Refer to Figure P.3 for technique for wrapping fragile objects.



1. Object with a fragile or delicate surface.
2. Wrapping Technique
 - a. Cut soft tissue (does not have to be acid free) into long strips.
 - b. Carefully wrap tissue strips around the object.
 - c. Tape ends to tissue only.
 - d. Repeat wrapping until object is completely covered with a few layers of tissue.

Figure P.3. Technique for Wrapping a Fragile Object

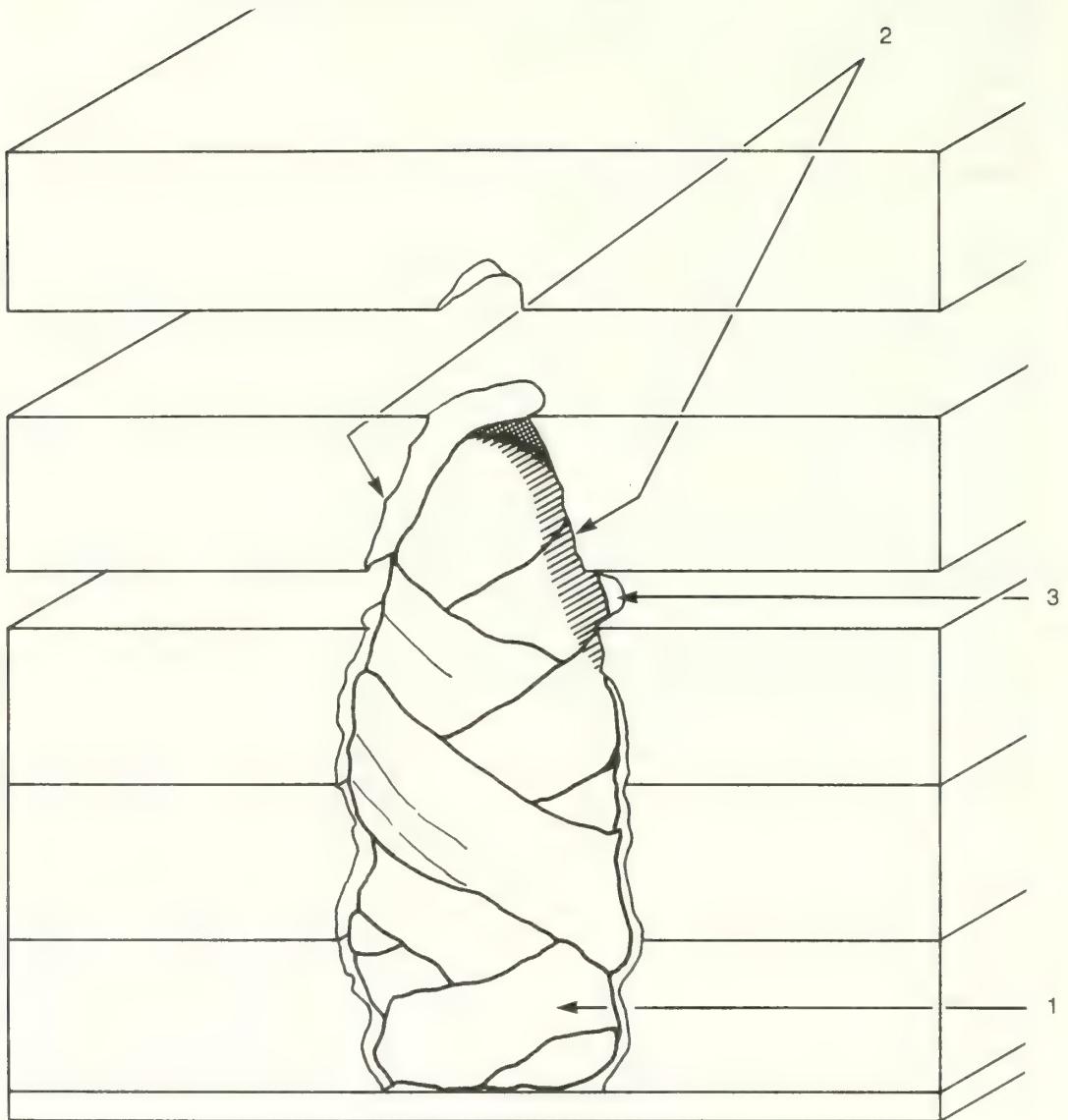
Fragile sculptures, or those with large flat surfaces, should be packed in layered foam cut to the profile of the object. The object should be first wrapped in tissue. Refer to Figure P.4 for an illustration of the technique for layered foam packing for fragile objects.

b. Large Objects/Sculpture

Large objects and sculpture usually require individual shipping containers with interior supports at weight bearing and stabilizing locations. Braces should be padded and the object may require tissue wrapping at brace-to-sculpture contact points. Some medium-size sculpture of very solid construction may not require double crating. In this case, the object should rest on a padded plywood base which is floated on a foam layer of appropriate density between the object support and the bottom layer of the crate. Ethafoam® is recommended for use with heavy objects.

Some of the containers may require multiple faces that can be removed from the base. Crate faces should be secured with bolts or heavy captive screws.

Forklift height and distance between tines should be taken into consideration when designing and constructing shipping containers.



1. Fragile object that has been enclosed in mummy wrapping. The tissue wrapping protects the object's surface from abrasion that may be caused by the foam packing material.
2. Cut layers of Ethafoam™ to completely fill the interior dimensions of the foam lined crate. Use a long knife (e.g., bread knife) with a fine serrated edge. The stack of foam is then cut in half vertically. Next, the contours of the object are cut in each half of the foam stack, one layer at a time. Nest the object in the center of the layers.
3. Fill any gaps in the foam's center with tissue paper. *Caution:* Do not put pressure on the object.

This technique works best when the top and front of the crate are removable.

Figure P.4. Layered Foam Packing for Fragile Objects

H. EMERGENCY PROCEDURES FOR CERAMIC, GLASS, AND STONE OBJECTS

Refer to Chapter 10 for guidance on emergency planning and to Chapter 8 for general rules on appropriate response to emergency situations involving museum objects. When the emergency affects artifacts, but does not endanger personnel, refer to the following section. During an emergency, it is essential to use common sense and handle the museum objects carefully.

1. Water

It is best to protect the objects from water leaks by covering them with plastic sheets or bags. A little water may not be harmful, but uneven wetting can cause mineral migration in stone (resulting in stains) as well as streaking through surface grime layers that can be difficult to correct. Painted pieces, unfired clay, or deteriorated stone and glass would suffer greater damage from water. The plastic should not be completely sealed as this would stimulate mold growth.

Raise objects off the floor onto blocks or skids if rising water is a problem. Have "dry areas" designated for object removal in cases where an entire floor or storeroom is flooding.

2. Fire

Remember, not only fire, but also smoke and water used in fire fighting can damage the artifact. These inorganic materials do not burn, but if a fire rages for a long enough period of time they can char, causing surfaces to blacken in appearance.

Plastic sheeting should not be used to protect objects during a fire. Polyester sheet such as Mylar® which has a very high melting point can be used (time-permitting) to protect the works from water and chemicals used in fighting fires.

3. Severe Weather/Bomb Attack

These emergencies could result in toppled and broken objects and sculptures, shattered cases, and flying glass.

Move objects away from windows. Cover glass cases or tape cases to avoid shattering and flying glass. Lay vertical objects on to their sides on floors or benches. If an object is attached to a base, it must be supported along its length so that it is horizontal. This action prevents unnecessary stress from being placed at the join between the object and its base.

Identify objects in the collection that should be evacuated first in situations where the viability of the structure is questioned.

4. Liquid Attack (e.g., acids, bases, solvents)

Vandals may throw or spill a liquid onto artifacts exhibited without vitrines or cases. Act quickly and avoid contact with the unknown liquid, such as sulfuric acid, lye, gasoline, which, in many cases, may be harmful to personnel.

Small, localized attacks should be rinsed well with water. Water should neutralize acids or bases and slow severe etching of the surface. Large objects, attacked overall, will have to be rinsed with copious amounts of water.

It is best to consult a conservator to ensure that the object has been adequately treated.

5. Broken Object

Cordon off the area and photograph the object in situ. If possible, do not touch anything until conservator arrives. If pieces must be moved, carefully collect all fragments, bag, label, and keep with the object until they can be turned over to a conservator.

If breakage does occur, count and save all the fragments and as many chips as possible. Handle the pieces as little as possible. Any dirt, dust, or abraded surfaces will impede a successful repair. Each fragment should be stored separately in a small individual box or a clear plastic bag which is labeled. Fragments can be stored in a padded tray and should be placed well apart from each other so they do not rub together. If the pieces must be transported, wrap each piece in soft tissue and identify with a label.

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J. SOURCE LIST

Refer to the NPS Tools of the Trade for information about sources for supplies. A list of special supplies is as follows:

Closed cell polyethylene foam lining - (e.g., Volara®). This material is available from:

Voltek, Inc.
100 Shepard Street
Laurence, MA 01843
Phone: 617/685-2557

Also sold under the name "Nalgene" by other companies, that is repackaged Volara®.

Zinc nitrate crystals- $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$. Available from: Fisher Scientific.

Artist's brushes for dusting- a natural hair brush such as camel's hair are relatively inexpensive and are available in a variety of sizes. Brushes for wet cleaning- both natural hair or synthetic bristle brushes are appropriate. The bristles should be stiff enough to loosen soil but soft enough not to scratch the surface of the ceramic. For both uses, wrap tape around the metal ferrule to prevent scratching the object. Available from local art supply stores.

K. ENDNOTES

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Appendix R: Curatorial Care of Photographic Collections

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APPENDIX R: CURATORIAL CARE OF PHOTOGRAPHIC COLLECTIONS

A. Overview

1. *What information will I find in this appendix?*

This appendix discusses the composition and physical structure of photographic materials and outlines their long-term care and preservation.

2. *Why is preventive conservation important for these materials?*

All photographic materials are especially vulnerable to deterioration when exposed to:

- inadequate environmental conditions
- improper storage enclosures
- careless handling practices
- damaging exhibition procedures

For this reason, preventive care is absolutely critical to the long-term preservation of these irreplaceable images.

3. *How can I find the latest information on care of these types of materials?*

Watch the following sources for new information and techniques:

- NPS *Conserve O Gram (COG)* series
- e-mail NPS *Museum Management Newsletter*

See the NPS Museum Handbook, Part I (MH-I), Chapter 3, Museum Objects Preservation: Getting Started, for a discussion of preventive conservation and conservation treatment.

B. The Nature of Photographic Materials

Photographs are images formed by the action of radiation, usually light, upon a sensitized surface. While often thought of as a single technique, photography is many hundreds of related chemical processes known by a wide variety of process and tradenames. Sources of assistance for descriptions of the various photographic processes are included in Section K.

1. *What is the component structure of photographic materials?*

The component structure of photographic materials includes a variety of:

- *final image materials*, such as silver
- *binders*, such as albumen, collodion, and gelatin
- *supports*, such as paper, plastic film, metal, or glass (also called the *base*)

Negatives, prints, transparencies, and slides are all photographs.

The laminate structure of prints is often further complicated by the presence of:

- secondary supports
- additional colorants
- coatings
- adhesive layers

- 2 *Why should I identify photographic processes?*
- 3 *What are the basic types of final image materials and how do they deteriorate?*

Identifying the photographic process (final image material, binder, and base) will allow you to accurately assess the relative short- and long-term stability of a specific photographic object.

The image in every photograph is created by materials that absorb and scatter light. Final image materials may include:

- photolytic or filamentary silver
- metallic platinum
- pigments
- organic dyes

The final image material in most nineteenth-century photographic prints is a finely divided **metallic silver**, identified as "printed-out" or "photolytic" silver. Photolytic, or metallic, silver particles are rounded in shape and scatter light, and, as a result, produce the red or brown image tones associated with nineteenth-century print materials in good condition. Photolytic silver particles are quite small and are extremely susceptible to image deterioration and rapid loss of highlight detail.

The final image material in most twentieth-century photographic prints is **filamentary silver**, which consists of bundles of intertwined filaments, resembling steel wool, that are huge in comparison to photolytic silver particles. These larger particles are significantly less vulnerable to image deterioration. Their irregular structure absorbs light rather than scatters it. Therefore, filamentary silver images are characterized by a neutral black image color, unless toned with gold, sepia, selenium, or hand-colorant.

All silver images are prone to severe oxidation and, as a result, undergo characteristic changes. Photolytic silver images exhibit general fading throughout, a loss of highlight detail, and a shift in image color toward warmer (more red or yellow) tones. Filamentary silver images, on the other hand, exhibit a significant shift in color from neutral black to yellow brown as they deteriorate.

Mirroring, a dark, mirror-like, reflective tarnish stain caused by oxidation, is a common symptom of deterioration in silver images. It often appears as a bluish, metallic sheen visible in a photograph's dense image areas when examined in reflected or raking light. Silver images also can be adversely affected by improper processing during

manufacture, resulting in a severely yellowed and faded final image material.

In platinum prints, the final image material is *metallic platinum*. Since platinum is a noble metal, it's not susceptible to oxidation. Therefore, platinum images don't tarnish or fade. Platinum is, however, a catalyst for cellulose deterioration. Platinum prints may exhibit an embrittled and discolored primary paper support.

Pigments, such as lamp black, burnt and raw umber, burnt sienna, and prussian blue, often have been used as final image materials for such printing processes as carbon, gum bichromate, and cyanotype. These pigments usually are dispersed in a binder, such as gelatin, gum arabic, or linseed oil, and tend to have good to excellent overall stability.

Finally, *organic (synthetic) dyes*, as used in most contemporary negative and positive color processes, are considerably less stable, and will fade both in the dark and upon exposure to light. The destruction or decolorization of organic dyestuffs in color photographs is due to irreversible changes in their chemical structure. Upon exposure to light, high humidity, or high temperature conditions, organic dyes are readily converted to oxidized and often colorless dye fragments.

4. What are the various types of binder layers?

The binder in photographic material is the transparent layer in which the final image material is suspended and protected. Binders are important in determining optical properties, such as surface smoothness, gloss, density, and color, as well as the overall stability of specific print materials. The binders most commonly used throughout the history of photography include:

- *albumen*, a globular protein from the white of hens' eggs
- *collodion*, a form of cellulose nitrate
- *gelatin*, a highly purified protein commercially produced primarily from animal hides and bones

Albumen (ca 1850-1900) actively deteriorates and yellows due to the inherent characteristics of the egg white protein and its chemistry. Albumen has a strong affinity for silver ions, and as a result, in processing these materials, colorless silver-albuminate complexes may be formed. Upon exposure to reactive sulfiding compounds, these colorless complexes may be converted to a yellow silver sulfide with a resulting increase in overall discoloration or staining leading to yellowing and loss of detail in non-image (highlight) areas. Albumen yellowing also occurs from prolonged exposure to light and high relative humidity conditions.

The albumen binder will expand and contract when exposed to fluctuating environmental conditions. Albumen prints, therefore, characteristically exhibit severely cracked and crazed binder layers. Albumen images almost always are mounted on a secondary support, since unsupported images will curl into tight rolls.

Collodion (ca 1851-1920) was used as a transparent binder in both glossy- and matte-surfaced photographic printing papers manufactured at the turn of the century as well as for ambrotypes, tintypes and the wet plate negative process that was introduced in 1851. Collodion is brittle, and is easily abraded and mechanically damaged when handled improperly.

Photographic **gelatin** (ca 1870-present) is a highly purified, homogeneous protein. While it is relatively stable and doesn't yellow severely like albumen, it is very reactive to changes in temperature and relative humidity conditions. When exposed to moisture, gelatin swells up to twenty times its volume, becoming soft and tacky. Finally, gelatin can serve as a nutrient for microbiological or fungal activity in conditions of high relative humidity and also is attractive to insects and vermin as a food source.

5. *What are examples of primary supports?*

The most common primary supports used throughout the history of photography include:

- paper
- glass
- flexible film
- sheet metal

In both historic and contemporary photographic print materials, the image-bearing layer usually consists of a coating on a **paper-based** support. When handled improperly, paper supports are susceptible to irreversible mechanical damage in the form of tears, creases, and losses.

In the early days of photography, these paper supports were manufactured from the highest quality rag fiber or chemically purified wood pulp. After 1881, machine-manufactured photographic papers were coated in the factory with a baryta layer, which consisted of the white pigment barium sulfate and gelatin. The baryta layer produced a highly reflective surface, allowing for greater contrast and brilliance in the final print. It also acted as a protective barrier between trace impurities in the primary support and the light-sensitive materials.

Plastic-coated, or resin-coated, photographic papers were introduced in the late 1960s. They were often subject to brittleness, cracking, and/or localized fading of the photograph's silver image. Within recent years stabilizers have been introduced into these papers. As a result, current plastic-coated papers, when processed correctly, are considered to be as stable as fiber-based supports.

While **glass** was the favored image support material in the nineteenth century, these supports may deteriorate under unfavorable environmental conditions. The chemical composition of support glass is the single most important factor pertaining to the long-term preservation of collodion plates. Deterioration of the glass support can result in softening and

flaking of the collodion binder and varnish layers as well as discoloration and fading of the silver image.

Nearly all existing still and motion picture *films*, prior to the introduction of polyester film in 1955, were produced on a cellulose plastic support. Earlier films were made from cellulose nitrate, first marketed in 1889 and manufactured until 1951. See NPS *MH-I*, Appendix M, Care of Cellulose Nitrate Negatives. Later films were composed of a variety of cellulose acetate supports. All cellulose plastic bases are subject to hydrolysis upon exposure to adverse environmental conditions, particularly high relative humidity. The hydrolysis of cellulose nitrate film, for example, releases nitrous oxide, a strong oxidizing agent that aggressively attacks image silver and severely embrittles the plastic film base as well as all nearby materials. Cellulose nitrate film base also is highly flammable and will burn underwater, as it produces its own oxygen during combustion. Valuable cellulose nitrate negatives must be reformatted and placed in cold storage.

In acetate films, acid hydrolysis won't accelerate silver image deterioration. However, the indirect consequences of hydrolysis may result in massive shrinkage and physical deformation, such as cockling, buckling, and channeling of the film base. Furthermore, acid-catalyzed hydrolysis will cause fire-retardant additives, historically incorporated into the film base during manufacture, to be released and deposited as liquid-filled bubbles in the gelatin binder.

Some of the earliest photographic processes used *metal* as the image's primary support. A daguerreotype photograph, for example, is a silver-plated sheet of copper with the whites or highlights of the image being a silver-mercury-gold amalgam and the darks pure silver metal. The daguerreotype plate is susceptible to deterioration resulting in the formation of corrosion films, primarily silver sulfide, on the support's surface. Tintypes were manufactured on japanned iron plates. The japanned surface was usually composed of a mixture of raw linseed oil, asphaltum, and lamp black pigment. A tintype's iron support may corrode or rust at the plate's unvarnished edges or anywhere the protective japanned surface has been scratched or otherwise damaged. Corrosion of the iron support may result in irreversible flaking and/or loss of a tintype's image-bearing (collodion) layer.

6. *Are there other structural concerns?*

Yes. When you analyze the component structure of photographic materials, you will also need to evaluate the presence or absence of a secondary support, hand colorants, final coatings (waxes, gelatin, and spirit varnishes such as shellac) and adhesive layers. Photographic prints often have been hand-colored with a variety of media, sometimes fugitive, including watercolors, pastels, and aniline dyes. These additional components can strongly influence the final appearance and stability of all photographic materials. Rubber cement adhesives, for example, can irreversibly stain and yellow binder layers.

C. **Preparing a Preservation Strategy**

A general understanding of the nature of photographic materials provides a basis for developing a preservation strategy for the collection.

1. *Why do I need a preservation strategy?*

A preservation strategy will help you care for and protect these diversified collections. In establishing a preservation plan, you need to understand and consider many issues pertaining to format and type, condition, housing, value, access, and use. In determining value, for example, you need to ensure that the collection materials support the park's approved Scope of Collection Statement and that these photographs are important for their artifactual, evidential, associational, administrative, or informational value. For example, heavily-used collections of lower value may be granted higher preservation priority when compared with little-used materials of higher value. See *COG 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication*.

Photographic collections should be assessed by a conservator for condition, processes, and format. The conservator should carefully examine all types of items in the collections, including albums, scrapbooks, and newer items such as microforms. Owing to quantity, it is often difficult, if not impossible, to examine all photographic objects in a collection; however, boxes and groups of items can be randomly sampled and assessed for storage, treatment, handling, and exhibition needs. In doing so, the conservator may make a checklist for tracking and quantifying general condition and deterioration problems associated with various photographic items. See Section H for a condition checklist.

2. *What are the basic elements of a preservation strategy?*

A preservation strategy tells you how to do the following:

- monitor, assess and control the environment
- establish handling procedures and a disaster plan
- rehouse photographic images
- reformat color materials and preserve originals in cold storage, where appropriate
- evaluate photographic materials for conservation treatment
- inspect negatives
- duplicate deteriorating materials
- inspect copy images

3. *How should I assess and control the environment?*

Survey storage facilities and exhibition spaces for evidence of the potentially damaging environmental conditions of relative humidity, temperature, light, and pests.

- Maintain the relative humidity (RH) levels for most photographic materials at 20% to 40%. You should strive for this range when storing all types of photos in one area. However, if you are storing only film-base materials, the preferred range is at 20% to 30% RH.
- Store most color and film-base collections at 4.4°C (40°F) or below. When you place collections in cold storage, they should remain in cold

storage as much as possible. Therefore, make copy negatives and prints available for duplication and research use.

- Monitor and control the environmental conditions, especially relative humidity, in collections storage and exhibits to reduce the potential for microorganism growth. When RH reaches 65% and temperature rises above 75°F, the potential for microorganism growth increases.
- Use the photographs at the appropriate light levels. See Figure R.1.

Century	Type of Photograph	Appropriate Light Levels
19th	Most 19th century processes	< 50 Lux or 5 footcandles
Late 19th (1880s)-20th	Photographs with Baryta Layers, such as Gelatin Printing-Out Paper, Collodion Printing Out Paper, and Gelatin Developing Out Paper	< 100 Lux or 10 footcandles
20th	Modern color photographs	< 50-100 Lux or 5-10 footcandles

Figure R.1. Appropriate Light Levels for Photographic Media

4. Should I establish handling procedures and a disaster plan?

Yes! First, establish handling and preservation procedures that are oriented toward stabilizing the condition of the entire collection.

Then, ensure that these procedures are followed so that the level of preservation is consistent throughout the collection.

Finally, establish a disaster plan to protect the museum collections in an emergency.

5. Should I rehouse photographic prints and negatives?

If the photographic prints are in acid-free or acid-neutral housings, you don't need to rehouse them, unless the housing is damaged. In all other situations, you need to rehouse photographic materials in acid-free archival sleeves and folders.

6. How do I rehouse photographic prints and film negatives?

If you need to rehouse *photographic prints*:

- place each print in archival-quality plastic or paper enclosures to prevent damage from chemical deterioration and improper handling
- place the enclosure containing prints in a box or drawer
- place boxes or drawers on shelves or in cabinets

If you need to rehouse *glass plate negatives* and stabilize them:

- place negatives in four-fold archival paper enclosures
- place negatives upright on their long edge in padded boxes
- place boxes on shelves

- label boxes "Fragile Glass"

If you need to rehouse *photographic albums and scrapbooks*:

- box them to protect them from dirt, dust, and gaseous pollutants
- interleave photograph albums with neutral pH tissue

Don't use buffered tissue or acid-free paper.

- don't use interleaving materials if they will cause stress on album bindings (such as significantly swelling a volume's width)

If you need to rehouse *daguerreotypes, ambrotypes, and tintypes*:

- house them in acid-free folding boxes
- identify actively deteriorating cover glasses and replace them with contemporary high-grade alumina silicate glass
- have a trained conservator supervise the uncasing and resealing operations

If you need to rehouse *film-based negatives*:

- place each negative in a sleeve
- place each sleeved negative in a box or drawer
- place each box or drawer on a shelf or in cabinet

7. How should I preserve color materials?

After housing, place color photographic materials in refrigeration or cold storage to slow irreversible deterioration. Cold storage promotes a longer life for the photographs being preserved. Even 20°F below room temperature provides many decades of additional life for photographic materials. Store collections of color negatives, transparencies, and prints, in archival housing within Ziplock bags in boxes, in a frost-free refrigerator with low-humidity refrigeration. You may place humidity indicator strips within the bag to help monitor environmental conditions.

If you must remove materials from the cold storage vault, for example if the power has been out for longer than 48 hours, allow the materials to acclimatize at room temperature for several hours before handling them.

Don't forget to monitor the frost-free refrigerator for temperature and humidity levels and to establish retrieval and access guidelines to severely limit the removal of materials.

8 How do I evaluate photographic materials for conservation and further preservation?

You should work with a conservator to learn how to identify photographic processes and formats and deterioration characteristics. Check photographic materials for:

- active flaking or powdering
- mold growth

- tape or adhesives present
- severely deteriorated supports

Ensure that photographic materials with these conditions receive conservation treatment.

9. *Who should inspect film-base negatives?*

You should work with a conservator to:

- inspect film-base negative collections and evaluate them for deterioration
- establish duplication programs
- develop handling guidelines
- establish archival storage procedures

10. *What about reformatting and duplicating deteriorating materials?*

You won't always be able to preserve all photographs in pristine condition. When faced with massive deteriorating photographic holdings, you will need to strike a balance between stabilization, treatment, and duplication.

Some processes, such as cellulose acetate and cellulose nitrate negatives may totally self-destruct over time in a normal storage environment. The self-destructive images are said to have inherent fault or inherent vice. The only way to preserve cellulose nitrate and cellulose acetate negatives may be permanent cold storage. In order to save the informational content of these negatives, it is necessary to duplicate these images using more stable materials. See *MH-I*, Appendix M, Care of Cellulose Nitrate Film, and *COGs* 19/10 through 19/13 on preservation reformatting.

Other photographic materials, while not as prone to self-destruction as cellulose acetate or cellulose nitrate, will deteriorate as a result of use, such as exhibition, regular handling, or frequent duplication. These heavily used materials will also benefit from duplication, as the duplicates may become the copies for use while the originals are preserved in cold storage.

Some scholarly researchers may still need to view the originals in order to study the image's process, format, or technique. In most cases, researchers are interested in the informational value of an image. Informational values may be captured in high-quality photographic copies.

If you need to rehouse and/or duplicate film-base collections, carefully consider the following options:

- **Interpositives.** For maximum quality control during duplication, you should produce an interpositive (intermediate positive image on clear film). Make this interpositive from the original negative by contact printing the image onto a sheet of clear film, producing a positive transparency. Then, make a laterally correct (not reversed) copy negative from the interpositive. Retain the interpositive to serve as an

archival master used for the creation of additional copy negatives. Use the copy negative as the duplication master to produce copy prints for staff and researchers. Keep the original negative in cold storage.

- ***Direct Reversal Film.*** Another procedure requires the use of direct reversal film, to produce a direct but laterally reversed duplicate negative. The resolution of direct-duplicating film is good, although tone reproduction can be poor. Because of their fine-grained structure these films are prone to oxidation leading to silvering out and mirroring, hence image detail loss. These images must be accurately processed and toned during use and carefully inspected and tested after creation. Such requirements make the actual cost of direct duplicates equivalent to interpositive processes without providing the same quality of images. Request either polysulfide toning or gold toning which will extend the life of the negative. Be aware that gold toning can add 20-50% to the cost. In many cases, direct reversal or direct duplicate images, also known as direct positive images, don't produce publication quality negatives.

Selenium toner was frequently recommended for use with all copy negatives, particularly direct duplicate negatives. However, the Image Permanence Institute (IPI) in Rochester, New York has found that selenium may not adequately protect a filamentary silver image in low density regions from oxidative attack. Don't request selenium toning of photographs. IPI is currently investigating the use of a polysulfide toner to which a small percentage of borax is added. For additional information, contact the Image Permanence Institute, Rochester Institute of Technology, 70 Lomb Memorial Drive, Rochester, NY 14623-5604, 716-475-5199.

- ***Copy prints and camera negatives or long-roll camera film.*** Other duplication options to consider include producing of copy prints and camera negatives from the original negative or using a long-roll camera film for efficient and cost-effective duplication of large collections. As with direct reversal film, these processes won't necessarily produce publication or exhibition quality copies and some of the images' informational value may be lost.

When you are faced with massive deteriorating film holdings, consult a conservator. See *COG 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication*. You should carefully evaluate the available duplication options discussed above and consider the following factors:

- collection's size
- informational value
- evidential value
- associational value
- administrative value
- artifactual value

- condition
- projected use
- funding and staffing resources available

Collection value, usage, and risk or stability probably should determine which items you duplicate first. Don't dispose of original negatives once duplicated unless they are in an advanced state of deterioration.

Finally, you should establish two regular inspection programs:

- One should evaluate the technical and archival quality of the duplicate negatives. Compare the duplicate's optical, tonal, and physical characteristics with the originals. See *COG 19/13, Preservation Reformatting: Inspection of Copy Photographs*.
- The other should be used for all deteriorated film holdings. Select envelopes from every drawer at random and examine them for signs of deterioration as mentioned above. Note incipient deterioration so that you can monitor specific materials during the following inspections. Inspect collections with unregulated climates and generally poor conditions as many as four times per year.

11. Who should inspect copy images?

You should have all interpositives, negatives, prints, and slides, whether produced internally or by an outside photographic studio, inspected upon return.

All photographic copy work done for preservation purposes should be done to American National Standards Institute (ANSI) standards. Cite these standards in all contracts with photographers. Don't pay for duplication until after the copies pass inspection. Inspect the copy versus the original for: resolution, tonal range, completeness of image, and residual levels of chemicals. Materials that don't pass inspection criteria should be reshot at the photographic laboratory's expense. See Section K for a list of the appropriate standards.

Have someone experienced in reading negatives and in darkroom work, such as a photographer (other than the photographer who did the copy work), inspect all images. Inspection requires experience and a trained eye. See *COG 19/13, Preservation Reformatting: Inspection of Copy Photographs*.

D. Preventive Conservation: Handling Photographic Collections

All photographic materials, color as well as black-and-white, may be irreversibly damaged by fingerprints, scratches, abrasions, and other forms of mechanical damage or mishandling. Here are some guidelines.

1. How do I handle photographic prints?

Historic photographic prints may be irreversibly damaged if handled carelessly. The surfaces of these prints are delicate and, therefore, easily scratched, abraded, creased, cracked, or torn.

General guidelines for ensuring object safety during any handling procedure are outlined in *MH-I*, Chapter 6, Handling, Packing, and Shipping Museum Objects. Some basic principles for the safe handling of historic and contemporary photographic print materials are listed below.

- Prepare a clean and uncluttered workspace for the safe handling of photographic collections. Instruct staff and researchers on the proper ways to handle photographs.
- Establish and enforce handling guidelines (for example, restricting food, drink, smoking, the use of pens) for all staff.
- Wear gloves when accessing collections that aren't protected by enclosures and when handling photographs that require temporary removal from paper or plastic sleeves. Research at the National Archives of Canada shows that immediate interactions will occur between salt in human perspiration and a photograph's final image material. These interactions result in irreversible oxidation of image silver to silver chloride followed by image staining or mirroring where the fingers touch the image. Staff and researchers who are required to wear cotton gloves will often approach a photographic collection with additional care and respect.
- Use temporary or permanent auxiliary supports (such as pH neutral board) during handling if necessary. In all instances, handle the auxiliary support and not the object itself.
- Exercise special caution when using plastic sleeves. Clear plastic sleeves are often too flexible to prevent structural damage. Slip a piece of archival bond (neutral pH) behind the image back before placing it in the sleeve. Transcribe any information from the back of the image in pencil to the back of the archival bond.

Removing unmounted photographic prints from their polyester sleeves may prove difficult because of the static charge of the polyester film. Slit the plastic sleeve at a sealed edge and gently separate the cover sheet from the photograph by rolling it away from the object's surface.

- Control access to all collections. Using copy prints and/or xerographic copies will greatly reduce handling and subsequent damage. Restrict the photocopying of all original materials. In doing so, maintain and use a "master" set of xerographic copies for all subsequent photocopying. See *COG 19/4, Archives: Preservation Through Photocopying*, and *19/7, Archives: Reference Photocopying*. Any collection that is regularly reproduced should have an effective system for creating master negatives so that originals need not be constantly photographed.

2. *How do I handle daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

- Establish current inventories, finding aids, and container (such as box or folder) lists for all photographic collections to further reduce unnecessary handling.

You should consider the daguerreotype, ambrotype or tintype and its original housing as a total artifact deserving protection as a whole. Don't disturb these housings unless absolutely necessary. If for any reason you remove an original housing, carefully label and retain them.

If you remove an original housing, use a small suction cup to carefully lift the "photographic package" out of the miniature case interior. This maintains proper configuration and orientation of the fabric liner that serves as a "compression seal" within the case and further protects the photographic image from oxidation. Don't use a suction cup if the brass mat and tape assembly are damaged or not present.

Do not disassemble the photographic package without the supervision of a trained conservator.

Restrict the handling of all original material to only those researchers who are working on images as evidence of connoisseurship issues or those who can't obtain sufficient information from the copy. All other researchers should use copy prints. Secure totally unprotected daguerreotypes and ambrotypes immediately. See Section G. Separate them from the collection to ensure protection against casual handling. Use a Form 10-645, Archives and Manuscript Collections, Separation Sheet to maintain the link between the object and its original location within the collection. See *NPS Museum Handbook*, Part II, Appendix D, Museum Archives and Manuscript Collections for guidance on this form. The surfaces of primary images may be damaged by careless handling because they are very fragile.

Caution both researchers and staff not to open a case completely (180 degrees) when viewing an image as this may cause severe stress on the hinge. Don't use the metallic clasps as they tend to abrade the surrounding leather or paper on the case. If the case is warped, locking the case may break the spine.

Remove loose surface dirt from the case's interior and exterior surfaces with a soft brush. Don't use other cleaning methods because the unprotected surfaces of both daguerreotypes and ambrotypes are extremely sensitive and must be handled with utmost care. Only a trained conservator should clean these materials following a careful assessment of need.

3. *How do I handle glass plate negatives and transparencies?*

Collodion and gelatin glass plate negatives and transparencies are very susceptible to damage. Their weight, bulk, and inherent fragility often pose the potential for serious handling problems. When handling glass plate collections, follow these guidelines carefully:

- Never underestimate the weight of glass. When working with these materials, be sure to have a firm grip on all enclosures in which glass plates are housed.

- Always handle glass on a padded and smooth work surface. You can construct this type of surface by padding a rigid piece of eight-ply board with successive layers of unbleached linen followed by sheets of lens tissues attached to the reverse of the work surface with pressure sensitive tape. As the surface becomes dirty, the sheets of lens tissue can be easily removed.
- Never handle the emulsion surface of a glass plate negative or transparency directly. Wear unpowdered latex gloves, since cotton gloves may be awkward and are inappropriate for the handling of glass artifacts.
- Before removing glass plate negatives or transparencies from their original (and often opaque) storage enclosures, always examine them carefully to determine the negatives' condition. In some cases, binder layers may be actively flaking and/or partially adhered to their enclosures. Glass supports may be broken or cracked. Safe removal may require that the original enclosures be slit at two edges with a microspatula and the plate carefully removed without scratching the glass or emulsion.
- Duplicate these fragile materials whenever possible. Use the copies for duplication services and reference purposes in order to avoid unnecessary handling of the original materials.

4. How do I handle film-base black-and-white negatives and transparencies?

Carefully restrict access to all film negative or transparency collections. The chemical by-products of deteriorating film could be dangerous to staff and visitors, resulting in skin and eye irritation, headache, nausea, and respiratory difficulty.

You can mitigate these effects by taking the following precautions:

- Improve room ventilation and air quality by changing the position of supply air registers and the overall level of air movement
- Use fans to maintain air movement while working with these collections
- Wear protective gloves at all times when handling film collection material
- Wear an appropriately rated respirator when handling large quantities of these materials. Respirators are not considered protective if facial hair interferes, because a proper fit cannot be assured. The respirators must be fitted to each employee. See NPS-50, *Guideline for Loss Control Management*, Release No. 2, Chapter 32, Respiratory Protection Program, for detailed guidance.
- Limit exposure time by staff and visitors

See *MH-1*, Chapter 11, Curatorial Health and Safety, for additional guidance.

5. How do I handle slide collections?

- Handle slide collections carefully to protect them from physical damage, fingerprints, and dirt.
- Don't leave slides in illuminated viewers or on light tables for longer than is absolutely necessary. (Kodachrome slides are particularly sensitive to light fading.) Also, don't leave slides uncovered on desks and table tops, as this exposure to ambient light may induce irregular fading and image deterioration.
- Keep the projection time for original slides to a minimum and use expendable duplicates whenever possible.
- Don't use high-intensity xenon arc projectors or other projectors that have been modified to increase their light intensity. It is usually light, and not heat, that causes fading when a slide is projected. (Some slides, however, may be more susceptible to heat-related damage, such as those with silver images including Polaroid Polachrome instant color slides and all types of black-and-white transparencies.)

E. Preventive Conservation:
Storing Photographic
Collections in the Proper
Environment

1. How do I store
photographic prints?

Environmental stability is essential to the longevity of all photographic collections. Where different types of photographic collections are stored in one space, you will need to set up many microenvironments in boxes or cabinets. Find the mean average humidity of what all materials in the room may need and use silica gel, humidifiers, or dehumidifiers as necessary to adjust the relative humidity. Specific materials need specific preventive conservation measures.

Store photographic print materials at a **constant** relative humidity (RH) between 30% and 50%, in dark storage (boxed). Avoid RH fluctuations of more than 5%. Exposure to high relative humidity levels dramatically accelerates the rate of deterioration and can result in the oxidation of silver image materials, binder layer staining, mold, and even permanent changes in size and shape. Excessively dry conditions, on the other hand, may cause cracking, crazing and embrittlement.

Store most photographic prints at 20°C (68°F) or below. Store contemporary color print materials at 4.4°C (40°F) or below.

The fading of color images is primarily controlled by the storage temperature and to a lesser degree by relative humidity. In all cases, carefully monitor temperature and relative humidity levels as described in *MH-I*, Chapter 4, Museum Collections Environment. See Figure R.2 for relative humidity and temperature requirements for various media.

Also, you will need to monitor and control (through air filtration) the levels of particulates and gaseous pollutants such as nitrogen dioxide, sulfur dioxide, hydrogen sulfide, and ozone.

Type of Photograph	Storage Temperature	Storage RH (Relative Humidity)
Most photographic prints, black and white negatives, direct positives, and transparencies	<68°F (20°C)	30-50% RH
Ambrotypes, daguerreotypes, and tintypes (Cased and Uncased)	65-68°F (18-20°C) ±2°	40-50% RH
Glass plate negatives and positives	68°F (4.4°C) ±2°	35% RH ±3%
Black-and-white silver gelatin film based negatives cellulose nitrate and acetate	As low as possible	20-30% RH
Color photographic prints, negatives, slides, and positive transparencies	35-50°F (2-10°C)	20-30% RH

Figure R.2. Relative Humidity and Temperature Requirements for Photographic Media

2. *How do I store daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

Daguerreotypes, ambrotypes, and tintypes are composed of a wide variety of materials. Store them at a RH of 40%-50% and temperature of 18°-20°C (65°-68°F).

Brass mats and preservers and iron supports of tintypes corrode at high relative humidity levels. Also, the glass used in glazing materials or actual supports for these photographic images is often chemically unstable. Don't store them in relative humidity conditions above 50% RH. On the other hand, leather, paper, and wood may become embrittled and cracked if stored in very dry conditions, contributing to structural deformations of the case. Maintain the relative humidity for these materials above 40%.

3. *How do I store glass plate negatives?*

Historic glass plate negatives are complex, laminate objects that require specific and controlled storage environments. The safe relative humidity range for the storage of glass plate negatives at room temperature conditions is 35% ± 3%. Avoid temperature and relative humidity fluctuations.

If the relative humidity is too low (below 30%), you may see severe flaking of the image-bearing layer from its glass support. If RH is too high (greater than 40%), you may see glass corrosion, silver image deterioration, microbiological attack, and even physical damage to the binder layer and varnish coatings.

4. *How do I store film-base black-and-white negatives?*

One of the most pressing problems facing large photographic holdings is the active and rapid deterioration of their film-base negative collections. Many unique images exist only as negatives. You will need to give the preservation of their informational content the highest priority.

Store these materials at 20%-30% RH and at temperatures as low as possible.

A very significant increase in film life is possible when storage humidity is lowered below 50%. Lowering the RH from 50% to 20%, for example, can improve expected film life four-fold.

Some other storage considerations for film-base negatives:

- Use a cold storage vault or commercially-available frost-free refrigerator or freezer to retard deterioration and prevent irreversible loss. Select these units carefully and monitor them routinely for temperature and relative humidity levels. See Section F.10.
- Restrict access to the materials housed within these units to staff who have been instructed in the procedures for collection retrieval of refrigerated or frozen items.
- Pack the negatives carefully in boxes. House negatives in Ziplock brand bags with humidity indicator strips.
- Use copies to access the original negatives in cold storage for copying or reference. If you must remove the originals for any reason (such as if you have a power outage of greater than 48 hours) allow them to acclimatize at room temperature for several hours before allowing access and use.
- Store deteriorated film-base collections in a well-ventilated location.
- Segregate nitrate films from other collections, preferably in their own freezer.

5. How do I store color photographic collections?

Color materials, including color negatives, slides, positive transparencies, and prints, are considerably more complex in construction than contemporary black-and-white materials. The storage environment is important.

Store these materials at 20-30% RH with a maximum temperature of 2°-10°C (35°-50°F). Store them for long-term at the lower rate, and be sure to avoid cycling. With color print, negative, transparency, and slide collections, storage *temperature is the most significant factor* in determining the rate of image fading and staining. Each -12°C (10°F) reduction in temperature will approximately double the life expectancy of color materials, as long as they aren't removed regularly from cold storage. High RH levels (greater than 65% RH) will promote the growth of fungus on emulsions, resulting in irreversible damage.

Color photographs are typically composed of at least three separate dye layers, consisting of cyan, magenta, and yellow organic dyes. The specific deterioration of these color photographic processes is often characterized by an overall loss of density; shifts in color balance caused by the unequal fading of the cyan, magenta, and yellow dyes; changes in contrast; loss of detail; and overall yellowish staining.

In addition, color photographic prints may crack and delaminate due to exposure to light or to widely fluctuating relative humidity.

6. What characteristics do I need to know about color photographic collections?

*Color image deterioration is the result of inherent instability of organic dyes. Consult Henry Wilhelm's and Carol Brower's book, *The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures* for more specific information on identifying and categorizing these unique deterioration characteristics.*

- **Dye fading that occurs in dark storage.** Like light fading, dark fading stability is also specific to the type of color film or print materials. The rate of dark fading is primarily a function of temperature and typically results in a final shift in color balance, as the cyan, magenta, and yellow dyes fade at differing rates.

Some color processes, such as Ilfochrome and Kodak Dye Transfer, are very stable in the dark. Kodachrome slide film is more stable in dark storage than Ektachrome slide film. Ektachrome, however, is more stable than Kodachrome if they are routinely projected.

- **Dark storage yellow stain formation.** This type of deterioration typically occurs with some color (chromogenic processes, including Kodachrome and Ektachrome) materials and often is a more serious problem than dye fading. For example, many Kodacolor prints dating from 1942-1953 now exhibit severe yellow stain formation especially prominent in their margins. This discoloration is caused by the unstable magenta dye-forming color couplers that remained in these prints following processing.
- **Choice of processing method.** The method of processing (stabilized or water wash) will often directly influence final image stability and the rate of stain formation. The image stability of instant color photographic processes (a stabilized process), for example, is very poor. Objectionable levels of yellowish stain may be observed in these stabilized, non-water washed materials after only a few months of dark storage.
- **Processing shortcomings.** Decreased dye stability and/or increased stain levels may result if color materials are processed using improperly replenished or contaminated chemicals or if the photograph isn't washed adequately so that residual processing chemicals remain. See Section G for a list of ANSI standards.
- **Image fading, staining, or physical deterioration.** These factors may be worsened by post-processing treatments. The application of lacquers, retouching materials, and high-pressure mounting techniques may adversely affect a photograph's final image stability.

F. Preventive Conservation: Housing Photographic Collections

1. How do I house photographic prints and negatives?

Consider funding and staffing, environmental conditions, and the use of the collection when deciding which type and style of enclosure to use. Individually folder, sleeve, or interleave mounted and unmounted photographs within acid-free boxes or stainless steel file drawers. Suitable photographic enclosure materials may be composed of chemically stable plastic or unbuffered, neutral pH paper materials. See COG 14/2, Storage Enclosures for Photographic Prints and Negatives.

Use the following guideline when selecting and ordering supplies, and require that the vendor meet its specifications: ANSI Standard IT9.2 1991, *Photographic Processed Films, Plates and Papers - Filing Enclosures and Storage Containers* (see Section K).

See the NPS Tools of the Trade (TOT), A Listing of Materials and Equipment for Managing Museum Collections, for sources of housing materials as well as other curatorial supplies discussed in this appendix.

2. What about paper photographic storage enclosures?

Paper storage materials must have passed an accelerated aging test known as the Photographic Activity Test (PAT). (Check with the vendor.) The PAT determines whether there will be harmful chemical or physical interactions between a photograph and its paper enclosure over its storage lifetime. (The PAT is described completely in ANSI IT9.16-1993.)

Photographic storage enclosures made of paper should have a high alpha cellulose content, a non-degraded form of cellulose frequently found in high-rag-content paper most desirable for paper to be permanent. Paper enclosures should contain no lignin, ground wood, or alum-rosin sizing. Printing ink shouldn't bleed or transfer, nor affect the image of the photograph.

The enclosure materials should be pH neutral at 7-7.5, and the paper *must be unbuffered* (not have an alkaline reserve). Current research, however, indicates that using buffered enclosures to house salted paper, albumen, gelatin, platinum, and collodion processes isn't detrimental provided humidity levels are maintained. It isn't necessary therefore to replace present buffered enclosures with unbuffered materials; however, purchase unbuffered paper enclosures when choosing new supplies.

Contemporary color processes, most particularly dye transfer and cyanotypes, require the use of unbuffered papers and enclosures.

There are a number of advantages and disadvantages in using paper enclosures for photographic storage. They are easy to write on and are generally less expensive than plastic materials. They are opaque, thereby protecting photographs from light. Unfortunately, this requires the users to remove each photograph from its individual paper enclosure prior to examination, which increases the possibility of damage.

All enclosures should be standardized and made to fit easily in acid-free boxes. Identify the photographic image in pencil on the outside of each folder before inserting the print.

Paper enclosures are available in several forms including envelopes, seamless enclosures, and folders. Try to use the four-fold seamless storage enclosure; it has no adhesive seam to attract moisture and contribute to image deterioration. You can easily remove the image from the enclosure without danger of abrasion. You can, however, support fragile materials on two-ply ragboard (of neutral pH bond) by placing the ragboard behind the image within the envelope to provide better support.

You can also place prints in individual acid-free folders, even placing several photographs in one folder. In this situation, interleave each photograph with a neutral pH, unbuffered sheet of paper which has been cut to the size of the folder. Don't place more than 15 items in a single folder.

Various types of unbuffered paper envelopes are available from conservation supply companies. Use envelopes with a narrow side seam, sealed with a non-hygroscopic and non-reactive adhesive, rather than a thick central seam. During storage, be sure the emulsion or binder side of the photograph faces away from the seam. Use envelopes with a top flap, as the flap prevents dust from entering the envelope. Each envelope should only hold one photograph; when this isn't possible, interleave them.

Don't use glassine or kraft paper envelopes for photographic storage.

You can mat mounted and unmatted photographs with 100% acid-free neutral pH ragboard window and back mats. See COG 13/1, Window Mats for Paper Objects. Fragile, damaged or severely warped mounted photographs as well as all photographs exhibiting a flaking binder layer may require sink mat and mount housing for additional protection. A sink mat is a museum mat for paper objects that has a recessed section in the bottom sheet that protects the paper object from contact with the overmat or cover sheet. Use sink mats for photographs that have been hand-colored with friable media such as charcoal, pastel, conte crayon, and similar media that can easily be smeared, as well as for photographic prints that have damaged surfaces.

Never dry mount onto secondary supports or laminate previously unmatted photographic prints.

Matted photographs may be hinged into their back mats with long-fibered Japanese tissue hinges attached with wheat starch paste, or mounted with good quality paper photo corners. Don't use polyester photocorners, particularly on fragile images, because they can cause abrasion. Don't use hard plastic corners or flanges because they may not be chemically neutral and some have sharp edges that may scratch, abrade, or emboss a photograph.

Paper photo corners, which should be as large as possible, are the most convenient and safe means of attachment when used properly. You can

fabricate these in-house from acid-free dense paper or purchase them from a conservation supply company. See COG 14/1, Making Mounting Corners for Photographs and Paper Objects. Any photograph with edges covered by the window mat may be mounted this way if it is strong enough to withstand its own weight resting on its lower corners while on display. The corners should be loose around the outer edges, to allow the photograph to expand with changes in relative humidity.

Reinforce the corners with a strip of archival quality linen tape or with pressure-sensitive tape adhered to the back mount. (The recommended pressure-sensitive tape for archival purposes is 3M 415 double-sided, polyester transparent tape coated with an acrylic adhesive.)

For storage, insert a sheet of unbuffered, light-weight neutral pH paper or polyester film between the photograph and the window mat to guard against abrasion. Examine carefully previously matted materials to determine their construction and materials stability.

3. What about plastic photographic enclosures?

Use plastic enclosures because they have the advantage of allowing an image to be viewed without removing it from the enclosure. This technique *greatly* reduces the possibility of handling damage and is ideal for large, high-access collections that haven't been copied.

If you use plastic enclosures, give special concern to humidity control. Photographic emulsions may stick, or "ferrotype," to the slick surface of these materials.

Use plastic materials ONLY if you can maintain relative humidity below 70%.

Suitable plastic enclosure materials include uncoated polyester and polypropylene. Don't use the following materials for housing photographic prints, negatives, transparencies or slides: chlorinated plastic such as polyvinyl chloride (PVC) or polyethylene sheeting, highly plasticized sheeting or coatings, or cellulose triacetate film.

Because of the build-up of static electricity, don't use plastic materials, especially polyester film, for housing photographs that have a flaking or friable binder layer or applied color.

Don't use plastic housing materials for images on glass, either negative or positive, as they are very prone to image flaking.

Also, one side of some polyester film photographic storage sleeves are slightly matted to avoid ferrotyping. The matting is done with silica dioxide or through roughening of one surface. Don't use these "matted" or "frosted" films for photographic storage.

You can choose from a wide variety of plastic enclosure designs available from conservation supply companies. Here are a few examples:

- ***Plastic sleeve.*** The sleeve is a plastic enclosure that opens along two or three sides. One particular polyester sleeve design you may want to use opens along both long sides with a flap. The flap allows inserting and removing of the photographs without potentially

dangerous sliding. "L" sleeves, sealed along a long and short edge, also allow for easy and safe access to a photographic print.

You can cut neutral pH, unbuffered mat boards (.01"- .02" thickness) to standard sizes and then insert them into the plastic sleeve, behind the photograph. The clear plastic sleeve allows the photograph to be viewed without being removed, and therefore protects the photograph from scratches, dirt and fingerprints. The neutral pH, unbuffered board neutralizes acids, provides fragile photographs with additional support, and allows the print to be identified without labeling directly on the image.

Take care when handling sleeved photographs, since they may slip or fall out of the open sides of the enclosures.

- **Polyester folder.** This enclosure is made by welding two sheets of polyester film together along one edge. These folders are most successful when used inside neutral pH, unbuffered paper envelopes. The polyester folder protects the photograph from handling whenever you remove it from the envelope.
- **Polyester sheet with multiple pockets.** You can use this system for housing small mounted and unmounted photographic prints within a larger-sized standard folder. It consists of two polyester film sheets that have been welded together to form standard-sized clear polyester film pockets or pouches. To maintain the original order of a collection, all images should be of the same size if this system is being used. Therefore, it may not be practical for a varied size collection.
- **Unbuffered acid-free folder with polyester film overlay.** This paper folder has the addition of a sheet of clear polyester film attached to its inside, along the right margin. It can be made in-house or purchased from archival vendors. This storage enclosure is particularly effective for housing unmounted and fragile albumen photographs that often have a strong tendency to curl.
- **Polyester/ragboard enclosure.** These "handling folders" are available commercially in standard sizes. They consist of a sheet of polyester film adhered at two edges in an "L" shape, adhered to a fractionally larger sheet of four-ply buffered acid-free ragboard. The photographic print is slipped under the polyester sheet and housed flat. This enclosure provides unmounted and fragile photographic prints with additional protection. However, mounted photographs are more likely to slip and slide within it, so this design isn't appropriate for all photographic formats.

4. *How do I house panoramic (oversized) prints?*

Panoramic prints, usually longer than "normal" photographic prints, are often found in a tightly rolled and vulnerable configuration. While you can flatten a loosely rolled print by placing it between two pieces of clean, dry, blotting paper under weights, many tightly rolled prints will crack and tear irreversibly if forced open without the proper humidification and flattening procedures. Consult a trained photographic conservator if in doubt.

You can house flattened panoramic prints in polyester film sleeves with a fold-lock closure at the long edge. You can purchase pre-welded lengths of rolled polyester in a variety of widths that can be cut to size as required. You can also insert a four-ply ragboard support into the sleeve for increased protection. Be sure to transfer any identification information from the back of the print to the back of the board *before* housing the print in the sleeve.

You also may house panoramic prints flat in heavy-weight paper folders. In some instances, it may be necessary to house these large format materials rolled onto neutral pH unbuffered tubes. Take care that the diameter of the tube is sufficiently large (4" or greater) to ensure adequate protection of the photograph. Once rolled with the binder side inward, cover the tube with polyester film, attached with a velcro button closure.

5. *How do I containerize sleeved prints?*

Once they are housed in individual storage enclosures, you can place photographic prints in acid-free file folders and special acid-free storage boxes that are free of lignin, ground wood, and alum-rosin sizing. Paper and board stock used to construct these storage boxes may be buffered (have an alkaline reserve). Use flat storage, in shallow acid-free boxes or flat file drawers, for fragile photographs and those which are adhered to brittle mounts. Be sure that all folders or enclosures exactly fit the inner dimensions of the storage box, so that they will stack neatly and not shift dangerously.

If they are in generally good condition, you can store 10" x 12" or smaller photographs upright in boxes or acid-free hanging file folders. Boxes and file cabinets must not be overcrowded, but also must not be so loosely filled that all support is lost. Equip vertical file drawers with rigid support of metal or acid-free mat board every 6"-8".

Fire resistive (insulated) filing cabinets are not recommended because they don't use space efficiently. They also are bulky for storage areas, and very expensive. A better storage method is to house photographs upright in boxes on steel shelving units.

6. *What storage techniques do I use to rehouse photographic materials?*

No single storage system is ideal for all photographic materials. Base your storage decisions upon format, type, condition, use, and value of the photographs. Those materials that are most heavily used should probably be rehoused first, followed by original photographic prints of high value and/or in fragile condition. A strategy for setting priorities is described in *COG 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication*. In order to reduce damage caused by handling, house those photographs most often used and requested in plastic enclosures. In all cases, use standard-sized storage enclosures only.

Photographic objects are particularly susceptible to the potentially reactive and volatile by-products released by some of the materials used in the manufacture of storage cabinets. Use only galvanized or stainless steel cabinets or steel cabinets coated with a baked-on-enamel finish or non-reactive powder coatings. These powder coatings are made by electrostatically applying powdered epoxy resin that is fused to the

enamel finish with heat. No solvents or plasticizers are used in the process.

Remove paper clips and staples from all photographs before storing them. Rusty paper clips or staples or other metal attachments may permanently stain, fade, emboss, and/or tear photographic prints. See COG 19/5, Removing Original Fasteners from Archival Documents.

During rehousing, examine all photographic items to assess the need for further preservation treatment. Learn to identify those deterioration problems that require immediate conservation treatment, such as photographic materials exhibiting actively flaking binder layers, the presence of pressure-sensitive and rubber-cement adhesives, and severely deteriorated and embrittled primary and secondary supports.

The presence of active mold growth is another critical problem that you should address immediately. You can prevent continued bio-deterioration by removing spores via aspiration, and then controlling the environment stringently.

7. *How do I house daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

These objects are frequently found housed in their original decorative folding cases that were often constructed of wood covered with embossed leather or paper. The photographic images are protected by a lacquered brass mat and a cover glass, usually bound together with paper tape and further covered with a decorative brass foil or preserver.

Each miniature cased object should have individual housing protection in the form of a wrapper or container that conforms to its three-dimensional format. You can house cased photographs in individual, custom made, four-flap boxes of heavy-weight acid-free folder stock. Boxes are also available from a variety of conservation suppliers in stock sizes.

Write the catalog number and other identifying information in pencil on the outside of the box. If possible, use acrylic adhesive on 3M mounting tape to adhere a 35mm contact print of the image to the outside of the storage box to help minimize handling of these fragile artifacts. Store the arranged cases flat, by size, in acid-free boxes or padded drawers. Vertical storage may be necessary for larger collections where space is a problem.

- *Loose daguerreotype plates.* These materials are extremely vulnerable, so give them the highest priority for protective housing. This may consist of a sink mat (see Section G), alumina silicate cover glass, and a pressure-sensitive tape seal. The sink mat may be fabricated from an acid-free unbuffered ragboard or die cut from 60 point polypropylene sheeting. To ensure adequate protection, use ragboard that has passed the PAT. When purchasing ragboard, check vendor's specifications. Filmoplast P-90 and Permacel J-Lar 4000 pressure-sensitive tapes have been successfully used for binding daguerreotypes. These chemically stable tapes are both manufactured using an acrylic adhesive. J-Lar provides a better barrier to moisture. The specific composition of these tapes may change in time. Therefore, rehoused daguerreotype plates must be carefully monitored to ensure that their deterioration isn't progressive.

Identify actively deteriorating cover glasses and replace them, as time permits, with contemporary glass. Ask a conservator to supervise all uncasing and resealing operations.

- **Loose ambrotypes.** House loose ambrotypes in four-flap neutral pH paper enclosures or envelopes. Protect the glass support from breakage by including a four-ply neutral pH ragboard sheet. House broken or cracked ambrotype supports in a sink mat, or sandwich them between two sheets of ragboard to await further treatment. Note that the ambrotype's surface is easily abraded and scratched, although the surface isn't as delicate as the daguerreotype's surface.
- **Loose tintypes.** House loose tintypes in good-quality paper or plastic, such as polyester and polypropylene film, enclosures. Four-ply ragboard inserted behind the tintype will provide its flexible support with additional protection. House sleeved tintypes vertically in acid-free boxes (never in plastic enclosures).

For tintypes that exhibit a flaking collodion binder layer, use four-flap paper enclosures only.

8. *How do I house glass plate negatives and positives (lantern slides)?*

Use a four-flap neutral pH paper enclosure for storing glass plate negatives and lantern slides in good condition. These enclosures should meet ANSI IT9.2 specifications (see Section K).

Storing each plate in its own enclosure prevents rubbing and abrasion on the plate. When using the four-flap enclosure, place the glass plate image in the center with each flap carefully folded over the emulsion side. This avoids the necessity of sliding the image in and out of the enclosure. Write any pertinent information in graphite on the outside of the seamless enclosure before the image is inserted. Some commercially-made paper sleeves aren't suitable for glass plate storage, as photographic emulsions can be irreversibly damaged through the action of sliding the plate in and out of an envelope.

*Never use plastic sleeves, envelopes, or folders with glass plates.
Don't place glass plates in cold storage.*

Caution: Only excessively dirty materials and/or those designated for duplication require cleaning. You should only attempt this cleaning after determining the emulsion side of the glass plate, usually the less glossy side. (If a question remains, consult a conservator.) During rehousing, carefully clean the non-emulsion or base side of the glass plate with a soft brush followed by a cloth slightly dampened with distilled water. Don't allow moisture to come in contact with the emulsion side of the glass plate.

House all glass plates according to size after making careful notes on their original order. Store glass plate negatives and lantern slides that are in good condition and smaller than 10" x 16", vertically (upright) on their long edge within the sleeves. Store them in metal file drawers or in acid-free, flip-top, reinforced boxes that contain no lignin, ground wood, or alum rosin sizing.

In each case, cut pieces of four-ply neutral pH ragboard to the size of the enclosures and place them as rigid dividers between every five to ten individually enclosed plates. These dividers will help support the weight of the plates and will also ensure that these fragile glass plates remain in an upright position as the collection is accessed by staff. Insert additional dividers or wedges to fill up extra space in a box or drawer.

Don't use traditional wooden grooved boxes for glass plate storage.

Cracked or broken glass plates should be duplicated to eliminate the need for further handling. Support them on their emulsion side with a clean, clear single-weight piece of high alumina silicate glass or non-textured Plexiglas of the same dimension. Protect the supported plate on both sides with four-ply neutral pH ragboard also cut to the size of the damaged negative. Then seal the sandwich at all edges with Filmoplast P-90 pressure-sensitive tape, and note the subject matter and condition on the ragboard support.

House glass plate negatives that exhibit active flaking or deteriorated binder layers and/or broken glass supports in custom-made neutral pH sink mat housings. Build these mats out of acid-free, single-walled corrugated board, laminated together with 3M 415 double-sided pressure-sensitive tape. Use neutral pH ragboard shims, attached to the back mat with 3M 415 tape to separate glass fragments to prevent abrasion along broken interfaces. Construct each sink mat with a hinged lid and be sure its height is sufficient so that its lid doesn't come in contact with the negative's surface. Standardize the outer dimensions of all sink mats.

In most cases mending isn't required and protective housing as described above should be sufficient. If mending is deemed necessary, ask a conservator to do it.

Finally, mark all folders and boxes containing glass clearly with the word "GLASS." Don't house boxes of glass plate negatives on upper or bottom shelves where they may be difficult to reach or lift. Glass plate negatives are easily damaged by vibration. Avoid housing them on mobile shelving.

9. *How do I house black-and-white negatives?*

Use three layers of protection when storing black-and-white negatives:

- Place each negative in a sleeve
- Place each sleeve in a box or drawer
- Place each box or drawer on a shelf or in a cabinet

House nitrate and acetate film-base materials in chemically stable buffered paper enclosures that meet ANSI IT9.2 specifications (see Section K). House sheet film negatives in four flap seamless enclosures or envelopes with a side, rather than central, seam. If envelopes are used, insert the negatives so that their emulsion surfaces face away from the seam.

Don't use plastic materials including mylar polyester for the storage of nitrate or deteriorated acetate negatives.

10. *Why do I place color photographic collections in cold storage?*

Cold storage is the only way to preserve color photographs in their original form for long periods of time. Therefore, with valuable color collections, be sure to use humidity-controlled cold storage for originals and copies for reference and duplication purposes.

Cold stored masters should be the original, regardless of process. Duplication and viewing copies should be available so that the original images don't need to be removed from cold storage. Each generation of copies loses some image detail and has some color shift. Avoid introducing a copy as the master, because subsequent copies are apt to be too distorted.

While all color photographic materials will benefit from cold storage, according to Henry Wilhelm there are specific color photographic processes for which cold storage is particularly imperative. These include pre-1984 Ektacolor, Fujicolor, Agfacolor, and Konica Color prints; all pre-1991 Kodak Ektachrome prints; color negative films, especially Ektacolor, Vericolor II, Kodacolor-X, and Kodacolor II; and color transparency films such as Process E-1, E-2, E-3, and E-4 Ektachrome films, ANSCO and GAF films.

The majority of color slides are one-of-a-kind transparencies produced by the reversal processing of chromogenic (Kodachrome and Ektachrome) film. No negative remains. The most important factors you need to consider in determining the useful life of color slides is their inherent dye stability and resistance to stain formation during aging. Improper processing of color materials can also adversely affect image stability.

The stability of color transparency film varies considerably. Kodachrome film, for example, is clearly the most stable transparency film in dark storage, yet it has the worst projector fading stability of any slide film currently available. E-6 Ektachrome film, in comparison, will develop high levels of yellow stain during dark storage but is more stable than Kodachrome when projected.

11. *How do I determine what is appropriate cold storage?*

You can create cold storage either by using a frost-free refrigerator or by constructing a cold storage facility. The latter option is significantly more costly and only appropriate for large collections of materials for which the use of refrigerator units isn't feasible.

12. *What do I need to know about storage in a frost-free refrigerator?*

Refrigerated storage is vital for the long-term preservation of pre-1984 Ektacolor, Fujicolor, Agfacolor, and Konica Color prints; all pre-1991 Kodak Ektachrome prints; color negative films including Ektacolor, Vericolor II, Kodacolor-X, and Kodacolor II; and color transparency films such as Process E-1, E-2, E-3, and E-4 Ektachrome films, ANSCO and GAF films.

A frost-free refrigerator will effectively slow the fading rates and greatly extend the life of color photographic materials. See *TOT* for specific makes and manufacturers. Operate these refrigerators in a well ventilated room, but not in the museum storage room. They give off a

considerable amount of heat. In the event of a power failure lasting longer than 48 hours, unplug the unit and leave the door open until the power is restored.

- **Environmental Monitoring and Control.** Maintain refrigerators properly. Monitor temperature and humidity levels at all times, ideally through the use of a datalogger drilled and attached to the refrigerator for external monitoring. Use conditioned silica canisters to help maintain the relative humidity. Place a separate thermometer in the refrigerator compartment where temperatures should be adjusted to 1.7°-4.4°C (35°-40°F).
- **Fullness.** Don't pack the refrigerator too tightly as constant air circulation is essential. You can use the vegetable and fruit storage drawers, but never place photographic collections directly on the bottom of the refrigerator compartment. Don't block the vent for forced cold air, and don't keep food and drink in the refrigerator.
- **Housing.** Package all color films and prints in envelopes and boxes and place them in polyethylene bags, such as heavy duty freezer Ziplock bags, or wrap them in polyethylene with all seams carefully sealed with freezer tape. Slide collections, packaged in paper or plastic boxes or slide pages, should also be sealed with polyethylene. This eliminates the need for pre-conditioning and prevents moisture condensation on the collection materials when the refrigerator door is opened or when they are removed and warmed to room temperature. Place moisture indicators inside the bags to help monitor environmental conditions.

If it is unavoidable, then carefully seal all photographs in vapor proof enclosures such as heat-sealable, aluminum foil envelopes. In doing so, precondition these materials at a low (30%-40%) relative humidity. These kinds of storage systems come with a constant risk of improper seals and punctured enclosures, so they tend to reduce, and in some cases realistically eliminate, access to the collection.

- **Preconditioning.** Pre-condition valuable photographs by storing them for several days at a low relative humidity for maximum safety. Keep objects in the surrounding environment several hours while they reach equilibrium with the surrounding air. Then seal them in vapor-proof envelopes and place them in the refrigerator.
- **Retrieval Guidelines.** Develop proper collection retrieval guidelines in consultation with a conservator. Warm-up times will vary and are dependent upon the amount of materials being removed. Don't routinely retrieve collections from cold storage. Instead, use access and duplication copies for research access and copying.

Allow a collection to warm up for 24 hours if you must retrieve it. During this time the collections should remain wrapped in polyethylene bags to prevent moisture condensation. Air should be allowed to circulate freely around the collections as they gradually warm to room temperature.

- **Refrigerator Selection.** If at all possible, don't use a freezer, or an older manual defrost or newer cycle defrost (energy saver) refrigerator. The unit should have separate refrigerator and freezer compartments. Both compartments must be guaranteed to be frost-free.
 - Cooling coils in the unit should be located only in the side of the freezer section. No part of the refrigerator or freezer that condenses moisture or forms ice crystals should be visible in the unit.
 - Air should be forced over the cooling coils and into the freezer section by an internal fan.
 - All cooling in the refrigerator section should come from cold air blown in from the freezer section by an internal fan.

13. *What do I need to know about storage in a cold storage vault?*

Because the design and construction of a cold storage vault for photographic materials requires specialized knowledge, you will need to select an experienced contractor and consult with curators, archivists, and conservators familiar with cold storage systems.

- **Environment.** For optimum protection, experts may recommend vault temperatures of -18°C (0°F) and relative humidity levels of 30%. These levels are difficult and expensive to maintain and aren't ideal in situations where collections are regularly accessed. For these reasons, many cold storage vaults in the United States are currently operating at 4.4°C (40°F) and 40% RH. Whatever the temperature, humidity cycling must be avoided in all cases.

Equip your vault with redundant and independent environmental systems in the event of equipment failure. Install air filtration systems to remove acetic acid and oxidizing gases. Outside the storage, install automatic dry-desiccant dehumidifiers with high efficiency particulate air (HEPA) filters. All cold storage vaults should have automatic shutdown systems that will activate when deviations from pre-set limits of temperature and relative humidity occur.

- **Housing.** Storage in a low temperature vault requires that the photographic materials be placed in acid-free boxes, portfolio cases, motion picture cans, and other enclosures safe for the long-term storage of photographs. Vapor-proof packaging isn't required.
- **Retrieval.** You also need to be aware that regular and constant retrieval of materials from cold vaults will directly affect their projected life expectancy. Heavily accessed materials may not benefit as significantly from storage in low temperature vaults—below -9.5°C (15°F). Therefore, be sure to make use and duplication copies of rare or fragile materials *before* placing the items in cold storage, so that the originals can fully benefit from cold storage and be preserved for a maximum lifetime.

Place packages removed from the vault in polyethylene bags and allow them to warm up gradually. Small packages, such as a single matted

14. When can I remove original photographic materials from cold storage?

color print, should have very short warm-up times and should be available for use almost immediately upon removal from cold storage.

15. How do I house color slide collections?

Don't remove originals from cold storage except in three cases:

- power outages of longer than 48 hours
- visits by photographic researchers who are studying details of process, format, and image manipulation
- the need to replace a damaged, deteriorated, or lost copy negative

Color slides not in cold storage, such as those that may be heavily used, should be enclosed in individual polypropylene or triacetate sleeves, unless kept in permanent or inactive storage. These sleeves should fit tightly around each slide so that the slides won't fall out. These sleeves aren't necessary for glass-mounted slides because glass mounts offer protection from fingerprints and scratches. Glass mounts don't reduce the rate of fading associated with dark or light storage.

You can also house slide collections in polypropylene slide pages, available in several gauges. (These pages may be used in conjunction with individual acetate sleeves.) The heavier gauge (5.0) is recommended for its superior handling characteristics. Rigid, open frame polypropylene Saf-T-Stor slide pages supplied by Franklin Distributors Corporation are also recommended. Avoid polyvinyl chloride (PVC) pages as well as low density polyethylene. Polyethylene's physical strength is inadequate and the presence of anti-block and slip agents that have been incorporated during manufacture may promote ferrotyping of the slide surfaces.

You can house large slide collections in acid-free boxes fitted with movable interior dividers or in baked-on enamel or powder-coated cabinets, but be sure that non-glass mounted slides are carefully protected from handling.

**G. Preventive Conservation:
Exhibiting Photographic
Collections**

1. How do I exhibit photographic prints?

The recommended environmental conditions for the exhibition of photographic print materials are identical to those for storage: 30%-50% RH and 20°C (68°F). Never exhibit photographic prints for more than four months per year.

Never place original photographic print materials on permanent display. Consider exhibiting facsimiles or copy prints where the use of original prints isn't essential.

Restrict illumination, either artificial or natural, for display of most nineteenth century photographic print materials to 50 lux (5 footcandles). This standard applies to all photographic materials which have exposed paper fibers, such as salted paper, platinum, and cyanotype; photomechanical processes, such as collotype and photogravure; and

albumen photographs. Fifty lux (5 footcandles) also is recommended for photographic prints that have applied color such as hand tinting and/or tinted binder/baryta layers. Prints with untinted baryta layers, most silver gelatin and collodion-chloride processes, may tolerate up to 100 lux (10 footcandles) exposure.

Never expose photographic materials to direct sunlight or ultraviolet radiation. If possible, use tungsten (incandescent) or fibre optic illumination instead. Incorporate filters and diffusers with all case lighting.

It's also a good practice to monitor the condition of photographic prints at frequent intervals while they are on display. Photochemical damage is usually most apparent as a difference in appearance between exposed print areas and those protected by the window mat. You can find procedures for monitoring print materials in Section K.

All framed photographs you select for exhibition should be paper hinged or photocornered into 100% neutral pH ragboard mats and glazed with ultraviolet filtering acrylic sheeting (Plexiglas). *Only* latex paints should be used to prepare walls and exhibition spaces, since the peroxides emitted during the curing of oil-base paints will accelerate silver image deterioration.

Finally, have a conservator stabilize any photographs that exhibit serious deterioration problems before exhibiting them. See *MH-I*, Chapter 8, Conservation Treatment, for guidance on conservation treatment.

2. *How do I exhibit daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

A cased object consists of the photographic image, decorative brass mat, and cover glass. These components are usually sealed with paper tape and flexible brass preserver. The photographic images themselves aren't particularly light-sensitive (for example, a daguerreotype plate won't fade upon exposure to light). However, the dyed decorative fabrics, paper, and leather integral to case construction, as well as some of the pigments used in hand-coloring, are very susceptible to fading. Natural resin varnish layers on tintype and ambrotype surfaces may yellow upon exposure to light.

Exhibit cased objects within closed display cases at low light levels (50 lux or 5 footcandles) for limited periods of time.

You also should maintain stable temperature and relative humidity levels within these cases. A sudden rise in temperature may cause an ambrotype's black lacquer backing to irreversibly crack and craze or a daguerreotype's gilded surface to exfoliate.

3. *How do I exhibit color photographic collections?*

All color prints, with the exception of Ultrastable Permanent Color, will fade when exposed to light during exhibition. Different types fade differently with some lasting significantly longer than others. Never subject valuable or non-replaceable color prints to prolonged (more than one week) display. Use copies instead.

For most color print materials the spectral distribution of the illumination source, for example, incandescent versus fluorescent, has relatively little

effect on their fading rates. In fact, it is the intensity of illumination that is important.

Keep illumination levels low: 50 to 100 lux (5 to 10 footcandles) are frequently recommended for the exhibition of color photographic material. Also, be sure to monitor prints with a reflection densitometer prior to and following exhibition, in order to have a qualitative record of a print's original condition and the complex changes that may take place following exhibition. Consult a photograph conservator for procedural guidelines to ensure that prints aren't damaged during the monitoring process and that the results are valid.

Color images deteriorate due to inherent instability of organic dyes. Wilhelm (previously cited) identifies and categorizes these unique deterioration characteristics. The characteristics pertaining to exhibited collections are as follows:

- Fading caused by exposure to light and ultraviolet radiation during display or projection. The rate of light fading is a function of the intensity of illumination and the duration of exposure. The rate of fading is also specific to each type of color film and print material. Most Kodak Ektacolor RC prints made between 1968-1977 and displayed for extended periods of time, for example, now exhibit severe image fading and color balance shift.

The light fading characteristics of modern materials vary considerably. Most modern chromogenic color print materials have an ultraviolet-absorbing coating and, therefore, UV radiation isn't considered to be a major contributing factor to the light degradation of these materials. Most of the fading that occurs with these papers is caused by exposure to visible light. Ilford, Ilfochrome and Kodak Dye Transfer prints don't have UV-absorbing coating. These materials will be quickly and irreversibly damaged by exposure to ultraviolet radiation. Ektachrome slide film is more stable than Kodachrome when the processes experience regular exposure to light.

In general, you should carefully restrict the exhibition of original color photographic prints and, where acceptable, substitute facsimile copy prints for long-term display.

- Light-induced yellow stain formation. For most modern color materials light-induced staining is a relatively minor problem when compared with the irreversible fading of cyan, magenta, and yellow dye layers.

H. Preventive Conservation: Inspecting Photographic Collections

1. *What is the Condition Checklist for Visual Images?*

The Condition Checklist for Visual Images provides a simple way for conservators or park curators who are familiar with visual images and their conditions to record the overall condition of an image, group of images, or collection, as well as the control numbers, location within a specific collection, physical process, format, and techniques, and specific deterioration conditions.

2. How do I use this checklist?

The form can be used to record this information for: a single image (for example, negative 5, of folder 9, of box 3, of collection X); a group of images (for example, negatives 43-97, of boxes 1-2, of collection X); an entire collection (for example, negatives 1-2000, of boxes 1-20, of collection X). When using the form for more than one image, check all categories that apply for that group of materials. You may need more specific data for planning purposes, such as the estimation of the amount of treatment work needed or rehousing needs. In such cases, use specific numbers to indicate the quantities of images that exhibit a specific trait (for example, brittleness 10 indicates that 10 images exhibit brittleness in the materials being evaluated).

3. Where do I find the checklist?

See Figures R.3a and R.3b for the checklist. An unpunched full size checklist accompanies this appendix. Keep the full size checklist as a master and make copies for your use.

I. Conservation Treatment Issues for Deteriorated Photographic Materials

1. What does this section cover?

This section describes appropriate treatments for different kinds of deteriorated photographic print materials in order to give you a sense of what will need to be done. In some cases, no treatment may be appropriate. In all cases, have a conservator treat these materials.

2. Why use a conservator?

In devising a valid treatment proposal, a conservator will evaluate the physical condition and chemical composition of all components that may be incorporated into these photographic materials, including the secondary support and its method of attachment, as well as the presence of handcoloring, retouching, and/or additional varnish layers. Historic and contemporary photographic materials are composed of a wide variety of organic and inorganic compounds, synthesized into a complex, multi-layered structure. The conservator will:

- consider potential reactions and interactions of these materials to proposed conservation treatment procedures.
- evaluate the photograph's historic and aesthetic integrity as well as the short- and long-term risks and merits of a particular treatment procedure
- identify the purpose (exhibition versus storage) and scope (single item versus large group) of a particular treatment in order to determine the nature and extent of possible reconstruction or restoration
- propose a viable treatment procedure to the curator that is based on all of these critical factors

3. What are the ethical considerations?

An accurate discussion of current conservation treatment practice should include an acknowledgement and understanding of the ethical principles and standard guidelines that conservators follow. All conservators are bound by a Code of Ethics. See *MH-I*, Chapter 8, Conservation Treatment, and Appendix D, Code of Ethics, for a detailed discussion of

Condition Checklist For Visual Images

Control Numbers:

Accession number(s) _____
Catalog number(s) _____
Item number(s) _____
Negative number(s) _____

Collection Name: _____

Location(s) of the Item(s) in the Collection:

Box number(s) _____
Folder number(s) _____
Item sequence number _____
Other number _____

Photographer(s): _____

Dates: _____

Physical Description:

Process(es) _____
Format(s) _____
Size(s) _____
 Color Monochrome
 Negative Transparency Print(s)
 Positive Transparency Drymounted
 Matted Framed Cased In Album
 Autographed Other _____

General Condition Analysis:

Excellent Good Fair Poor

Specific Condition Analysis: (Check all that apply and indicate approximate quantities or percentages when dealing with large quantities)

a. Primary Support/Secondary Support:

- | | |
|--|---|
| <input type="checkbox"/> Brittleness _____ | <input type="checkbox"/> Tack holes/punctures _____ |
| <input type="checkbox"/> High acidity _____ | <input type="checkbox"/> Adhesives _____ |
| <input checked="" type="checkbox"/> Lignin content _____ | <input type="checkbox"/> Tapes _____ |
| <input type="checkbox"/> Cockling/buckling _____ | <input type="checkbox"/> Discoloration _____ |
| <input type="checkbox"/> Curling _____ | <input type="checkbox"/> Waterstains _____ |
| <input type="checkbox"/> Folds/creases _____ | <input type="checkbox"/> Matburn _____ |
| <input checked="" type="checkbox"/> Wrinkles _____ | <input type="checkbox"/> Foxing _____ |
| <input type="checkbox"/> Warp _____ | <input type="checkbox"/> Mold _____ |
| <input type="checkbox"/> Tears _____ | <input type="checkbox"/> Insect/vermin accretions _____ |
| <input type="checkbox"/> Losses _____ | <input type="checkbox"/> Dirt/grime _____ |
| <input type="checkbox"/> Holes _____ | <input type="checkbox"/> Fingerprints _____ |

Figure R.3a. Condition Checklist for Visual Images (Sample)

Condition Checklist For Visual Images

b. Image Layer/Media:

- Fading _____
- Color shift _____
- Discoloration _____
- Water stains _____
- Oleaginous stain _____
- Silver sulfiding or tarnishing _____
- Loss of highlight detail _____
- Loss of dense detail _____
- Loss of surface gloss _____
- Emulsion flaking _____
- Applied color flaking _____
- Bleeding/feathering of applied color _____
- Surface cracking/crazing _____
- Surface abrasion _____
- Embrittlement _____
- Media stuck to another object _____
- Emulsion softening _____
- Emulsion powdering _____
- Cockling/buckling _____
- Channeling _____
- Dimpling _____

- Emulsion bubbling or flow _____
- Binder migration _____
- Trim _____
- Cut _____
- Tears _____
- Losses _____
- Holes _____
- Adhesives _____
- Cloth tapes _____
- Plastic tapes _____
- Dirt/grime _____
- Dust _____
- Smoke damage _____
- Fingerprints _____
- Insect grazing _____
- Mouse chew _____
- Insect or vermin accretions _____
- Mold _____
- Foxing _____
- Other (Describe) _____

Additional Comments:

Figure R.3b. Condition Checklist for Visual Images (Sample)

conservation treatment and the Conservator's Code of Ethics. These codes address the critical issues of treatment practice, such as:

- In the treatment of photographic materials, all actions must be governed by respect for the integrity of the photograph including its physical, historical, aesthetic, and cultural significance. The conservator must adhere to the highest and most exacting standards.
- The conservator must restore deteriorating materials according to an understanding with the owner, custodian and, in some cases, the photographer, if living. Conservation treatment must not modify or conceal the true nature of the object. It must be detectable, although it need not be conspicuous, and must be fully documented. A conservator must use appropriate materials and techniques that will have the least adverse effects and that can be removed most easily and completely. Conservation treatment procedures must not impede future examination or treatment possibilities.

4. *What treatments will the conservator use?*

While many of the conservation treatments discussed apply to both nineteenth- and twentieth-century photographs, they do *not* apply to contemporary color materials. The complexity of modern color materials eliminates most treatment options.

It is important that these treatments be carried out by a conservator who specializes in photographic materials. Improperly done, these treatments will cause irreversible and catastrophic damage.

Practical, reversible, and predictable conservation treatment procedures for deteriorated photographic print materials are continually being developed and refined. However, many questions remain unanswered. Many objects are left untreated as informed conservators advocate restricted handling and stringent environmental control for the preservation of particularly fragile materials for which treatment isn't, at this time, an option.

- *Removal of Microorganisms*

The organic constituents of photographic materials are vulnerable to microbiological attack associated with upper extremes of temperature and relative humidity. The most effective treatment in all but the most severe cases is modification of the environment and removal of the mold growth from the affected item by using a vacuum aspirator or tweezers.

Mold removal may yield a fragile and disfigured surface, requiring careful consolidation and inpainting by a conservator. Primarily because of their potential toxicity and chemical reactivity, the use of fungicides or fumigants in the treatment of mold-damaged photographic materials has been curtailed radically. See COG 3/4, Mold and Mildew: Prevention of Microorganism Growth in Museum Collections, for guidance on monitoring and controlling the environment to prevent microorganism growth in collections.

- *Consolidation of Flaking Binder Layers*

In some cases, photographic images will exhibit moderate to severe flaking of their binder layer, thus requiring immediate consolidation by a conservator. (Consolidation is the application of an adhesive to improve cohesion between a deteriorated binder layer and its substrate.)

Consolidation techniques also may incorporate the use of aqueous or non-aqueous solutions, the choice of which is typically dependent on the physical and chemical compatibility of the consolidant and its selected solvent with the deteriorated binder layer. The use of solvent-soluble adhesives such as acrylic resins, for example, may not be appropriate for the consolidation of a deteriorated collodion binder layer. Likewise, the high pH of acrylic dispersions, often ranging from 8.0 to 9.0, may prove problematic for use with proteinaceous binders. The conservator will also need to evaluate any additional properties, such as long- and short-term reversibility, flexibility, adhesive strength, chemical reactivity, and the possibility for irreversible visual alteration.

- *Reduction of Surface Dirt*

Photographic images exhibiting embedded dirt and grime may be carefully surface cleaned after a conservator has thoroughly evaluated the possibility for physical or chemical damage, as well as permanent alteration in surface reflectance or gloss. Conservators employ a variety of materials and techniques in an attempt to reduce dirt and grime layers effectively from photographic surfaces. These include soft brushes, non-sulphur-containing crumbled vinyl erasers, distilled water and organic solvent solutions applied with cotton swabs and/or balls.

Severe structural damage to a binder layer may prevent dirt removal. This is often true of deteriorated albumen photographs, in which the egg white binder is severely cracked and crazed. The conservator must be extremely careful when cleaning photographs in which the final image material is embedded in the paper support, such as salted paper or platinum prints, as these images are abraded easily.

On film-based negatives and transparencies and slides, park staff may use compressed air available in aerosol cans (for example, Dust-Off, Omit) to reduce surface dirt. This procedure should be performed under the guidance of a conservator and only on film in good condition with no evidence of physical damage. Some aerosol canned products contain oily gray substances. Test first by spraying on a white blotter.

Photographic materials that have accumulated a lot of surface dirt and dust may require immediate attention by a conservator, who will safely remove superficial loosely attached dirt with a dry, soft brush.

- *Removal of Tapes and Adhesives*

In order to safely remove paper hinges, residual adhesives, and pressure-sensitive tapes from a photograph's surface, a conservator may use direct or indirect moisture vapor, methyl cellulose poultices, aqueous solutions, organic solvents, and many other accepted paper conservation techniques.

- *Removal of Poor-Quality Secondary Supports*

The vast majority of historic photographic prints were mounted during manufacture, with mounts usually consisting of a poor-quality lignin-core board sandwiched between two thin, high-quality papers. Lignin decomposition products may react with proteinaceous materials such as albumen or gelatin, producing a highly colored compound and/or emitting oxidants such as peroxides and causing silver and dye image materials to fade and discolor. In addition, these secondary supports are often acidic and embrittled, posing serious structural danger to the photographs themselves. If this is the case, use extreme care in handling these fragile materials, and consider conservation treatment.

If undertaking treatments of this type, the conservator will consider the historic and aesthetic integrity of the photograph's secondary support. Through careful visual and microscopic examination, the conservator will evaluate the possible deleterious effects associated with the mounted photograph's adhesive and secondary support material, as well as the sensitivity of the photograph's component structure to possible physical or chemical damage during treatment.

Typical backing removal techniques involve mechanical removal, the local application of moisture vapor or steam, and/or immersion in aqueous or organic solutions. Treatment choice will be dictated by the photograph's structural and chemical condition. Inadequately hardened gelatin prints, for example, may swell dangerously when exposed to moisture. Exposure to moisture via surface cleaning, humidification or immersion will likely cause albumen binder layers to crack and craze, with a resultant loss of surface gloss. Many albumen and silver gelatin photographic prints, therefore, may require absolutely dry techniques, such as the use of metal or Teflon spatulas, for the safe removal of their deteriorated secondary supports.

- *Humidification and Flattening*

Humidification and flattening of rolled, cockled or warped photographic prints are critical operations that, if done incorrectly, may induce dimensional instability, irreversible damage to a binder layer, and/or irreversible staining in the photograph's primary support. However, a conservator can develop treatment strategies for the humidification and flattening of curled photographic prints and, in some cases, park staff can be trained to carry out these procedures as well.

- *Chemical Treatment*

An issue of considerable importance and active debate in the photograph conservation field today is the use of chemical treatment. The dire consequences of ill-advised treatments can't be ignored. For this reason, most practicing conservators agree that many chemical treatments, such as the bleach and redevelopment of faded silver images, particularly on fine art photographs, require more research before use.

- *Structural Repair*

Photographic prints exhibiting creases, tears, losses, and other structural damages may be mended by a conservator utilizing accepted paper conservation techniques. In most cases, the conservator can mend tears successfully by using the appropriate weight Japanese paper combined with wheat starch, gelatin, or methyl cellulose adhesive.

- *Remounting of Photographic Prints*

Photographic prints that have been removed from their mounts during treatment may require lining or remounting in an attempt to stabilize, consolidate, strengthen, and facilitate handling for exhibition and/or storage.

In selecting the appropriate mounting technique, the conservator will consider a variety of factors pertaining to the photograph's condition and appearance prior to and following mounting. The conservator must take into account the potential for cracking or crazing of an albumen binder layer, for example due to the expansion and contraction of a wet secondary support. This may occur in many currently practiced remounting techniques.

Methods used by conservators to remount photographic prints include:

- line unmounted photographs directly onto Japanese papers or rag papers and boards using methyl cellulose or wheat starch adhesives
- line a humidified photograph with Japanese paper and wheat starch paste onto a sheet of unbuffered two- or four-ply ragboard that has been counterlined on the reverse to minimize warpage
- adhere the unmounted photograph onto a smooth-surfaced rag paper with wheat starch or methyl cellulose adhesive

The polyester fabric or "Dacron," which is then pasted onto sanded Plexiglas, acts to hold the photograph's secondary support under tension and is removed following drying.

The latter technique may be particularly suitable for the mounting of larger collections or holdings of photographic prints, as the cost of materials and time requirements can be minimized.

Each of these mounting techniques has distinct advantages and disadvantages. Discuss the ramifications associated with each of these options with your conservator.

- ***Compensation of Losses***

Following remounting, a conservator may inpaint abrasions, scratches, tear edges, and other disfiguring damage in a photograph's surface by using a variety of media, including watercolors, ground pigments in acrylic resins, and pastel pencils. In all instances, the conservator will first evaluate the long-term aging characteristics of the selected media and their "compatibility" with the damaged photograph in terms of chemical reactivity, solubility parameters, and surface qualities. The extent of compensation should also be discussed and agreed upon in collaboration with the curator or collection manager.

J. The Recovery of Water-Damaged Photographic Materials

1. How should I recover water-damaged materials?

See *MH-I*, Chapter 10, Museum Collections: Emergency Planning for guidance on emergency planning, and to Chapter 8, Conservation Treatment, for general rules on appropriate response to emergency situations involving museum objects.

If at all possible, water-soaked photographic materials should be air-dried, laid flat on a clean surface or hung on a line with clips that won't leave indentations (not binder clips). If you can't air-dry these materials, due to lack of personnel, facilities, and/or time, freeze them and then thaw and air-dry them later. Don't freeze glass plates or lantern slides.

Vacuum freeze-drying is the next preferable alternative. In this system place the photographs in a vacuum chamber either wet or frozen. The vacuum is pulled, a source of heat introduced, and the photographs, which dry at temperatures below 0°C (32°F), remain frozen until dried. Vacuum freeze-drying may result in a significant loss of gloss and/or a strong tendency to curl. The tendency to curl may be overcome by careful humidification following freeze-drying. In all cases, *avoid vacuum thermal-drying* whereby photographic materials are dried at temperatures above 0°C (32°F). As a result, photographic binder layers will have a strong tendency to block or stick together irreversibly. Don't vacuum freeze dry glass plates or lantern slides.

If photographs have been immersed in dirty water, a disaster recovery team should carefully wash them in changes of cold, preferably distilled, water prior to air-drying or freezing. Carefully monitor the condition of the photographs to ensure that binder layers or original ink annotation on mounts aren't being damaged. Some color processes may require bathing in a stabilizer prior to air-drying. Consult a conservator.

2. What should I salvage first?

In general, black-and-white photographic prints appear to be more resistant to water damage than contemporary color materials. Photographic film-base negatives are more resistant to deterioration than print materials. Depending upon the collection priority, you may want to salvage color materials first.

Mold grows after 48 hours above 65% RH and 21°C (70°F). Emulsions soften and stick if not separated during the drying process. During salvage, rescue the following first: silver gelatin processes (prints, negatives, and transparencies), glass plates, lantern slides, ambrotypes, daguerreotypes, color materials and acetate and nitrate film base. Albumen processes, collodion prints, salted paper prints, cyanotypes, and platinum prints can be done last.

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ANSI IT9.2-1991 (Enclosures and Containers)
ANSI IT9.6-1991 (Safety Film Stability)
ANSI IT9.11-1991 (Safety Film Storage)
ANSI/NAPM IT9.11-1993 (Storage of Photographic Film)

ANSI/NAPM IT9.16-1993 (Photographic Activity Test)
ANSI IT9.20-1994 (Storage of Photographic Prints)
ANSI/NAPM IT9.18-1994 (Storage of Photographic Plates)
ANSI PH1.51-1990 (Photo & Micrographic Film Dimensions)
ANSI/ASC OG4.8-1985 (Residual Thiosulfate)

These items are available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, 212-642-4900; or from the Association for Information and Image Management, 1100 Wayne Avenue, Suite 1100, Silver Spring, MD 20910, 301-587-8202.

Appendix S: Curatorial Care of Objects Made From Leather and Skin Products

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APPENDIX S: CURATORIAL CARE OF OBJECTS MADE FROM LEATHER AND SKIN PRODUCTS

A. Overview

1. What information will I find in this appendix?

You will find the National Park Service's present understanding of objects made of leather and skin products. You also will learn about preventive care for these objects including:

- agents of deterioration posing the greatest threat to these objects
- measures for preventing or minimizing the impact of these agents
- techniques for handling, marking, and cleaning these objects
- methods and techniques for improving storage and exhibit conditions
- methods for monitoring the condition of these objects

2. Why is it important for me to practice preventive conservation with these objects?

Advancements in the treatment of leather and skin products have not kept pace with the progress made in conserving other kinds of museum objects. The conservation field only can offer limited solutions to the problems facing objects made of leather and skin. Conservators and the scientific community have begun to focus more specifically on developing new treatment strategies for the preservation of leather and skin. While new information is provided as it becomes available, you need to practice sound preventive conservation now because:

- preventive measures stabilize objects and leave opportunity for appropriate future interventive treatments
- conservators can only offer limited treatment solutions

Conservators discourage traditional interventive treatments, such as the application of saddle soaps and dressings. *Avoid interventive conservation treatment of leather and skin objects whenever possible.*

See NPS Museum Handbook, Part I (MH-I), Chapter 3, Museum Objects Preservation: Getting Started, for a discussion of preventive conservation and conservation treatment.

3. How can I find the latest information on care of these types of materials?

Refer to the following sources for new information and techniques:

- NPS *Conserve O Gram* series
- e-Mail NPS *Museum Management Newsletter*

B. The Nature of Leather and Skin Products

1. What is the structure of skin?

The skins and hides from vertebrates constitute the class of natural materials called skin products. Leather is one type of skin product that is produced by a particular tanning process. Processed and unprocessed animal skins have supplied the basic fabric for making utilitarian and decorative objects since prehistoric times. You will often find these materials in art, history, ethnology, and science collections.

Animal skin is a fibrous layer of living tissue that protects an organism from the elements. Figure S.1 illustrates its structure.

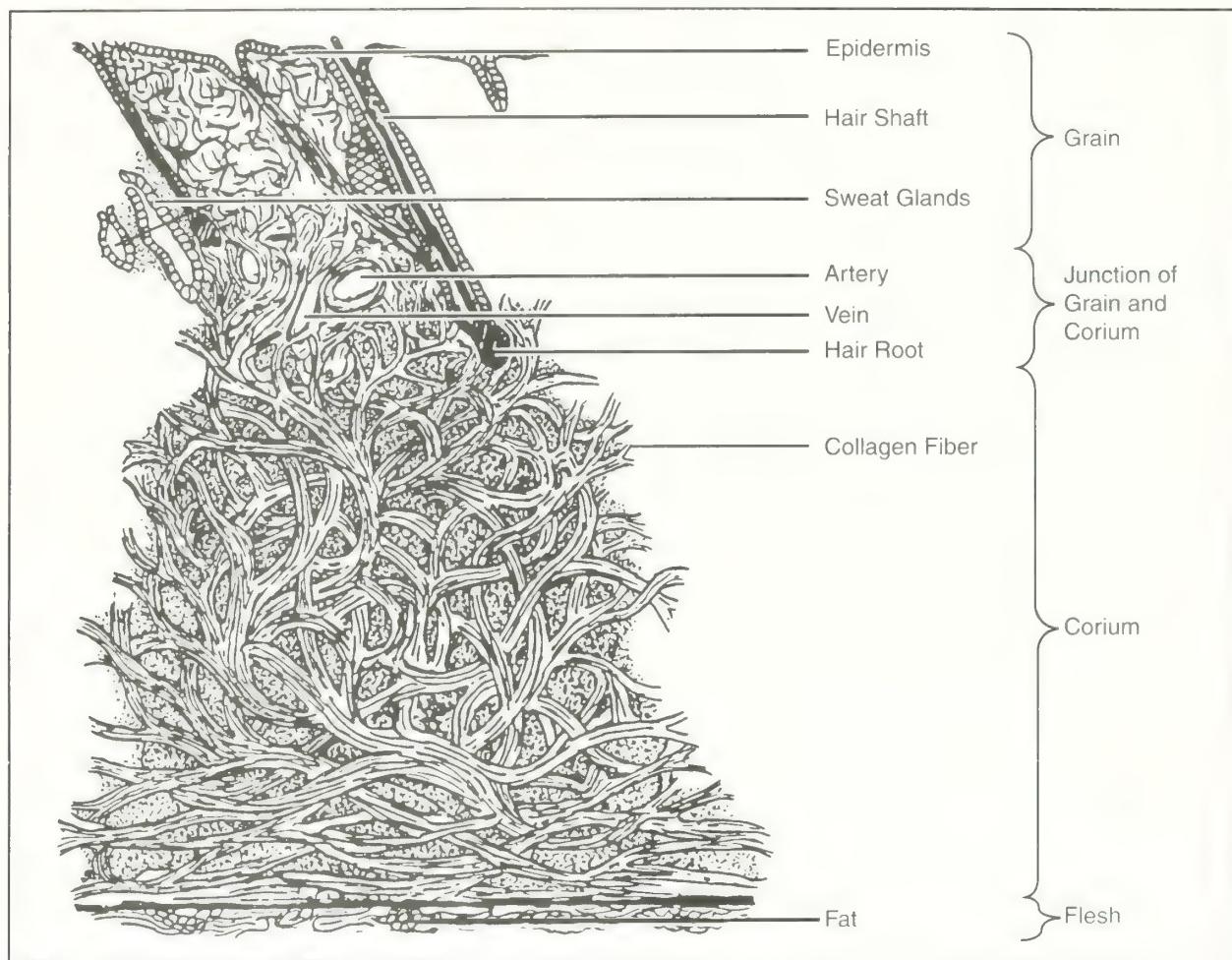


Figure S.1. The Structure of Skin

Once removed, an unadulterated skin is a proteinaceous sheet containing hair, sweat glands, fat and blood vessels, as well as its basic constituent of collagen fibers. These protein fibers are composed of coil-like molecules built of tiny fibrous strands that are twisted together, then aligned side by side overlapping one another, much like cotton fibers are arranged in a textile yarn. (To prevent separation of the cotton fibers the yarn is twisted during manufacture to produce a strong and usable thread.)

2. How is animal skin processed?

Animal skin can be tanned and untanned. Examples of untanned skin include rawhide, parchment, and vellum. Stable skin is processed by chemically binding fibers together, commonly referred to as tanning. The amount and type of bonding that occurs within a skin establishes its "degree of tannage." The term "leather" refers technically only to the fully tanned skin products. Figure S.2 describes degrees and types of tannage of most skin and leather objects in park collections.

Un-tanned	Semi-tanned	Native-tanned	Fully-tanned
rawhide parchment vellum	oil tannage alum tannage	smoke tannage brain tannage oil tannage	vegetable tannage mineral tannage combination tannage

Figure S.2. Degrees and Types of Tannage

People have preserved or "tanned" skin products in many ways to render them strong, insoluble, and more resistant to temperature and moisture. Nearly all of the methods of skin processing techniques used by skin and leather workers throughout the ages achieve some degree of tannage. Many of these procedures rely on mechanical properties more heavily than chemical tanning, such as the softening that results from introducing oils.

Unfortunately, determining an object's original manufacture requires considerable study. While laboratory treatments vary for different types of skins and leathers, *preventive conservation procedures are similar for most of these materials*. Your familiarity with the general skin processing categories can be very useful since these methods are responsible for many of the object's functional characteristics. See Figure S.3 for physical characteristics of these products.

3. How do I recognize different species?

The skin or hide of each animal species is recognizable by its physical characteristics. The principle variations among animal types are the size, density and distribution of the animal's hair, which gives rise to a distinctive grain pattern.

The relative thickness of hide and skin products is traditionally measured in "ounces." Each ounce represents 1/64 of an inch. The black solid lines in Figure S.4. represent the thickness of leather being measured.

CHARACTERISTICS OF LEATHER AND SKIN PRODUCTS

	RAWHIDE	OIL TANNAGE	ALUM TANNAGE	SMOKE TANNAGE	BRAIN TANNAGE	VEGETABLE TANNAGE	MINERAL TANNAGE
TANNING MATERIAL	No Tannage Applied	Cod Liver Oil and Other Oils	Alum or Aluminum Sulphates or Chlorides	Aldehydes from Wood Smoke	Animal Brains	Extracts of Wood Chips, Bark, Leaves, Roots, Fruit	Chromium Sulphates or Chlorides
COLOR AFTER TANNAGE	White to Yellow	Dull Yellow	White	Yellow to Yellow/Brown	White to Yellow	Yellow/Orange to Light Brown	Bluish White to Pale Green
EFFECT OF WATER	Stiffens, Dissolves, Turns Transparent	Water Absorbed, Tan Stable	Stiffens, Water Removes Tan	Water Resistant	Stiffens, Water Absorbed	Water Absorbed, Water Removes Tan Slowly	Water Absorbed, Tan Stable
TYPICAL USES	Saddle Trees, Drumheads, Scabbards	Gloves, Wettable Leathers	Gloves, Pelts and Furs, Book Bindings	Native American Clothing, Lodges	Native American "Buckskin" Clothing and Objects	Shoe Soles, Saddles, Book Bindings	Clothing, Shoe Uppers

Figure S.3. Characteristics of Leather and Skin Products

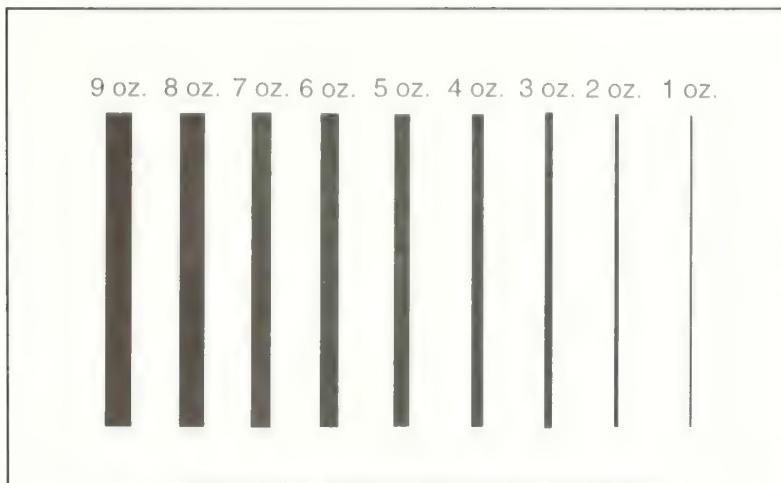


Figure S.4. Thickness of Skins and Hides

The characteristics and uses of common animal skins and hides are listed below.

Cow Hide

- Grain/hair pattern: pebbly, pronounced with large, equidistant hair spacing
- Thickness: 2 to 20 ounces
- Processing note: often split into several pieces
- Special feature: very durable, excellent for tooling and carving
- Uses: shoe soles, belting, trunks, clothing

Calf Skin

- Grain/hair pattern: same as cowhide only smaller
- Thickness: 1.5 to 4 ounces
- Special feature: greater uniformity and fineness than cowhide
- Uses: upholstery, shoe uppers, clothing, bookbindings

Bison Hide

- Grain/hair pattern: similar but less uniform than cattle
- Thickness: 5 to 20 ounces
- Special feature: loose-knit fibers on flesh side; very large hide size; stiff hump between shoulders
- Uses: 19th century boots, sleigh blankets, Native American shields, robes, clothing, tipis

Horse Hide

- Grain/hair pattern: resembles cow hide but less dense
- Thickness: 3 to 7 ounces
- Special feature: strength, texture and thickness are inferior to cow hide; compact fibers, especially in butt region
- Uses: whips, aprons, base for enameled leathers, trunks

Deer Skin

- Grain/hair pattern: large follicles form definite single rows; closely spaced fine hairs are similar to goat skin
- Thickness: 2 to 9 ounces
- Processing note: hairs are sometimes left on
- Special feature: loose structure (like sheep) results in a very stretchy leather
- Uses: parchment, gloves, clothing; Native American clothing, moccasins, containers

Sheep Skin

- Grain/hair pattern: linear groupings of large and small groups
- Thickness: 1.5 to 3 ounces
- Special feature: weaker, less durable skin (loose interweave of fibers); loosened texture (fibers run parallel to skin surface)
- Uses: suede leathers, bookbindings, jackets, gloves, chamois

Goat Skin

- Grain/hair pattern: groupings of three coarser hair follicles with closely spaced fine hair follicles
- Thickness: 2 to 3 ounces
- Special feature: close-knit collagen fibers; more durable and stronger than sheep skin
- Uses: linings, billfolds, shoe uppers

Pig Skin

- Grain/hair pattern: very coarse hairs are sparsely distributed in groups of three
- Thickness: 3 to 4 ounces

- Special feature: high fat cell content produces tough but spongy leather; very rough surface; limited water resistance
- Uses: shoes, bags, gloves, pants

Exotic Leathers

Reptile

- Special feature: surface patterns distinguish reptile type: crocodile, alligator, snake, or lizard
- Special feature: light, thin, grainless leathers often are made from bellies

Fish

- Special feature: structure is different from mammals but scales are comparable to hair on mammals

Seal

- Special feature: proportionally stronger than other leather materials; fur is left on for coats, fur is removed from base for enameled leather

C. Agents of Deterioration

The ways that skin products deteriorate can be identified and categorized. The interdependency of these mechanisms cannot be overstated. For example, temperature changes directly affect a skin or hide's moisture content, the rate at which chemical deterioration proceeds, and the object's susceptibility to biological infestation.

1. What is the threat of biological infestation?

A great variety of biological organisms are attracted to skin and hide products making these materials subject to quick and irreversible damage or total destruction. For example, insects are frequently attracted to the oils present in skin products as well as surface soils. Also, poorly cleaned materials are particularly attractive as a nutrient material for insects and microorganisms, as are all items made from rawhide.

Most insects prefer skin products made from fur and unborn animal skins. The most frequent infestations involve dermestid beetles and clothes moths, but other beetles and moths also attack skin and fur on occasion, as do silverfish and cockroaches.

Insect development usually relies on higher levels of humidity and temperature.

Since skin products are acidic in nature, microbial deterioration of skin products is generally limited to molds and occasionally bacteria. This deterioration is primarily due to environmental factors such as high humidity (above 65% RH) and a wide temperature range (in most cases 10°-40°C [50°-104°F]). These organisms produce organic acids and enzymes that bleach and stain the skin. Fungal growths are often characterized by a white, grey or green fuzzy appearance. These

growths occur most commonly on objects made from rawhide and on those skin products that have become heavily soiled.

2. *How do I prevent pest problems?*

Here are some measures to prevent or minimize biological infestation:

- Monitor all areas of the museum continually and systematically to identify insect and microbial problems at an early stage. Use insect monitoring traps and routinely inspect objects for frass, nesting materials and damage. See *MH-I*, Chapter 5, Biological Infestations, for guidance on developing a museum Integrated Pest Management (IPM) Program.
- Identify dead or living pests that you suspect of attacking skin objects.
- Develop a pest control program that includes a designated staff coordinator, with guidelines for preventive and emergency measures. Its focus should be pest control through good housekeeping and modifying the environment.
- Minimize microbiological attack of skin products by keeping relative humidity below 65% and by keeping areas clean.
- Never apply insecticides and fungicides directly to hide artifacts because they can damage the objects, complicate long term preservation, and contaminate the material for future handling and study.
- Gaseous fumigation methods available for skin and hide materials are few and require coordination by a conservator. In addition, contact the park, center, or your IPM coordinator prior to pesticide use. Technology is constantly changing and the coordinator will have access to the latest and most appropriate solutions. Your IPM coordinator must authorize and approve all pesticide use before application.

Non-toxic means of extermination such as freezing are preferable. See NPS Conserve O Gram 3/6, An Insect Pest Control Procedure: The Freezing Process, for guidance on the technique of freezing for controlling pest infestations.

3. *What about the loss of hair and fur?*

The loss of hair and fur from skins and hides not only devalues an object, but also can destroy its potential usefulness. The causes of hair or fur loss are complex and usually depend on the form and structure of the animal, the hide's original processing techniques, and the environmental conditions to which it has been subjected.

There are numerous types of hair loss:

- Epidermal slippage: hair is lost as the epidermal layer separates from the dermal layer.
- Deterioration of the individual hair follicles: hair roots become loose and hair falls out.

- Hair shaft breakage: mechanical damage weakens the hair and it breaks at its base.
- Biological attack: insects feed on the hair itself or epidermal layer, resulting in the hair being severed.

You can't do much about hair loss that is due to insufficient fixing during processing, but you can control many of the other causes, such as high temperatures, low relative humidity, photochemical degradation, and insect damage.

4. *How can I stop hair and fur loss?*

To limit the loss of hair and fur:

- Minimize the exposure of fur or hair products to lighting; illuminate only to the minimum level necessary to see the object. Recommended levels are 50 lux (5 footcandles) or less.
- Minimize handling.
- Stabilize the relative humidity and temperature to which hides with hair and fur are exposed. Don't expose them to rapid changes of either temperature or humidity and protect them from desiccation.
- Routinely inspect hair and fur products for insect damage. Remove loose or broken hair by brushing and vacuuming, and store materials in insect-proof containers such as metal museum storage cabinets with door gaskets.

5. *What is the threat of thermal reaction?*

Skin and leather products are thermosensitive. Skin tissue has a heating threshold, or point of thermal contraction, which is referred to as its shrinkage temperature. For newly processed skins and hides, this point is frequently between 60°-75°C (140°-167°F). However, the shrinkage temperature of degraded hides of aged objects can be considerably lower.

Heating dries out, embrittles, and deforms skin and leather objects. Changes in temperature also can destabilize relative humidity levels. Exhibit lighting, direct sunlight, and proximity to heating registers and radiators can easily damage leather and skin objects, which also become more sensitive to heat as they age.

Elevated temperatures cause eventual damage not only by speeding up the chemical deterioration processes, but by causing unstable fats and oils to come to the surface where they often deposit as unsightly spews. Spews (also spelled spues) are surface deposits of solidified fats and oils that exude from the interior of the leather/skin material. They appear as a white crystalline deposit or as a whitish bloom. Desiccation can also result from over-heating.

6. *How can I minimize the threat of thermal reactions?*

Try these preventive measures to minimize thermal reaction:

- Safeguard skins from exposure to warm, moist air. The acceptable minimum and maximum temperature levels are from just above freezing to 20°C (70°F).

- Reduce the damaging effect of heat cycling by placing objects away from external building walls, exterior doors and windows, exposed pipes, heating and air conditioning vents, direct sunlight, exhibit lighting sources, and locations such as hot attic spaces.

7. What about water and moisture damage?

While skin materials have a great affinity for water, inappropriate levels of atmospheric moisture or direct wetting usually cause serious damage. The direct wetting of skin products initiates deterioration because these materials have only a limited degree of water resistance. Rawhide, parchment and vellum are most prone to damage. Aged objects made of full-tanned leather are also highly susceptible to stiffening and darkening from wetting.

All animal materials readily absorb moisture from the air. Excessive moisture (levels above 65% RH) causes swelling of the skin's fibers and encourages biological infestation. Excessive dehydration (humidity levels below 22% RH) forces the skin to give up moisture permanently, which results in shrinkage and deformity.

Dehydration reduces the skin's ability to take up and hold moisture, thus weakening it and dramatically decreasing its flexibility. Repeated exposure to moist and dry cycles will, eventually, physically stress the hide's fibers enough to induce mechanical damage and increase its susceptibility to chemical deterioration. The hide's soluble components are frequently displaced, leached, or deposited on the surface resulting in the alteration of physical characteristics.

When skin material is subjected to either excessive moisture or high humidity in conjunction with heat and acid conditions, its chemical structure is attacked, causing shrinkage and embrittlement. If allowed to continue, the skin will lose its structure and become gelatinous. The boiling of skin to produce gelatin or hide glue is an example of this process.

8. What are the measures for limiting water and moisture damage?

To minimize water and moisture damage:

- Keep hide materials dry by protecting them from wetting and exposure to relative humidity levels above 65%. House objects in water-resistant containers, such as storage cabinets and exhibit cases. Whenever possible, include moisture absorbing materials to buffer enclosed spaces against extreme fluctuation of RH. These materials may include commercially-available buffers such as cotton or linen cloth, acid-free paper products, or silica gel. See *MH-I*, Appendix I, Curatorial Care of Archeological Objects, for a discussion of the use of silica gel.
- Control the relative humidity to conform to the recommended levels suitable for the collection's circumstances. Stabilize humidity fluctuation to the recommended range of 40-60% RH. Normally, you will regulate humidity through the central air-handling system, but you also can use localized and portable sources of humidification/dehumidification to protect objects from unnecessary damage.
- If you discover mold on objects made of leather or skin, consult a conservator regarding vacuum cleaning and disinfectant procedures.

9. What is the threat of prolonged exposure to oxygen?

For organically-based materials like skin products, prolonged exposure to oxygen is one of the more serious and avoidable chemical factors that causes deterioration and is responsible for altering both the skin's chemical structure and many of its tanning compounds.

Its long-term effects include the hardening of skin and hide material, embrittlement, cracking and crazing of the skin surface and overall yellowing or darkening as well as a number of serious internal structural changes. Oxidative degradation is caused by high temperatures and humidities and exposure to light radiation.

10. How can I minimize these oxidation reactions?

By taking the following preventive measures:

- While it is impractical to keep most of these materials from being exposed to oxygen, if an object is extremely rare, consult with a conservator about storage and display in a hermetically sealed container filled with inert gas (such as nitrogen or helium).
- Don't expose hide materials to excessive humidity or heat. Use air conditioning, storage design and exhibit design to eliminate the detrimental effects of these environmental stimulants of oxidation.
- Reduce the level of visible light to the minimum required and eliminate exposure to ultraviolet light.

11. What about pollutants?

The threatening forms of pollutants to skin products are particulate and gaseous pollutants. Particulates are solids that are suspended in air and range in composition from inorganic to organic. Because skin has such a porous and absorbent surface, these solid foreign materials easily work their way into the fibrous network of skin products causing soiling, staining and eventual stiffness.

Little data is available regarding the effect of gaseous pollutants on skin but it is probable that oxidant, acidic and sulphating gases play some role in the deterioration process. Native-tanned and semi-tanned materials seem relatively more resistant than do commercial, vegetable-tanned leathers. It is likely that pollutants promote oxidation, hydrolysis and overall discoloration.

12. How can I minimize the effects of pollutants?

To minimize their effects:

- Modify the building's central air conditioning and filtering system. Various filters can trap different size particles, and effectively remove gaseous contaminates.
- Exhibit and store your objects in tightly sealed enclosures constructed of the highest quality inert materials. Install specialized pollutant absorbers with individual storage cabinets.

13. What harm can light cause?

Light is an important factor in the process that degrades skin products. Its damage is cumulative and irreversible.

Certain wavelengths break down polymeric bonds and are detrimental to all skin materials. The ultraviolet range of light is one of the most

dangerous wavelengths for skin products; however, visible light also causes structural damage and color change.

Light can act as a catalyst when oxygen, water vapor and various pollutants in the atmosphere combine to increase the rate of deterioration. The rate of degradation is generally related to the intensity and length of light exposure. Fading of smoked and pigmented hides is a particular problem where prolonged light exposure is involved.

14. How can I minimize the effects of light?

Take these preventive measures:

- Minimize the exposure of skin materials to visible light; illuminate only to the minimum level necessary to see the object. Recommended maximum levels are 150 lux (15 footcandles) for most materials and 50 lux (5 footcandles) for painted skins and hides with fur.
- Eliminate ultraviolet (UV) radiation through the use of UV absorbing filters installed between the light source and the artifact or on the light source itself. Select lighting systems with low proportions of UV radiation. The maximum acceptable proportion of UV radiation is 75 microwatts per lumen.
- Maintain stored objects in darkness. Ensure that unfiltered light does not reach stored skin and hide materials.
- Monitor and adjust lighting fixture locations and light bulb wattage individually. Use timers and dimmers for controlling light in exhibits.

See MH-I, Chapter 4, The Museum Environment, for general guidance on temperature, relative humidity, light, and pollution.

D. Preventive Conservation: Guidelines for Leather and Skin Object Care, Handling, and Storage

The most successful method of preserving leather and skin products is a good preventive conservation program. This program needs to include systematic collection care, handling and storage practices, and regular inspection and condition evaluation. This approach replaces the traditional practices and remedies of the past that have been found to be detrimental to museum objects.

For longer life of skin and leather objects follow these general guidelines:

- Identify the general category of the skin product correctly.
- Understand the product's basic characteristics, as well as its deterioration features.
- Upgrade the general environment that includes controlling climatic conditions, minimizing light exposure, providing physical support, and protecting from mishandling, soil accumulation, and pest infestation.

- Inspect, evaluate, monitor, and document an object's condition, periodically; record the urgency for conservation treatment.
- Provide specialist care for those objects requiring complex or considerable conservation treatment.

And follow these specific guidelines:

1. How do I provide a stable and appropriate humidity?

Use enclosures such as exhibit cases or storage cabinets to stabilize humidity and reduce handling, soil accumulation, and attack from microorganisms and insects.

Set relative humidity to an acceptable range: less than 5% RH change within a 24-hour period and an annual change of no more than $\pm 8\%$ fluctuation from the set point.

Humidity parameters are frequently 40%-60% RH; however, the specific set points will vary according to:

- climatic considerations
- an object's state of deterioration
- your facility's air handling capability
- requirements of any composite and associated materials present
- the relative humidity with which the object has reached equilibrium

2. How do I monitor the condition of objects?

Inspect objects for deterioration regularly. If you do not regularly evaluate and document their state of degradation, deterioration of leather and skin objects can go undetected and unchecked. Evaluate the condition of objects thoroughly when they are acquired. Then, inspect the objects periodically to identify progressive damage, such as lengthening of tears, increases in surface or pigment loss, and evidence of biological attack. Finally, use a conservator to assist in periodic surveying of significant objects in order to establish conservation treatment needs. See *MH-I*, Chapter 3, Museum Objects Preservation: Getting/Started, for guidance on Collection Condition Surveys.

3. How do I clean objects?

The degree to which each soiled object can be cleaned is a function of the nature of the soil and the sensitivity of the object. Clean an object only as necessary to remove airborne soil accumulation.

Don't directly apply chemical reagents such as cleaners, dressings, waxes, and coatings: they are not beneficial and will complicate future conservation treatment.

You can't remove some surface soils by simple cleaning methods, and other soils are not removable at all. Highly deteriorated objects cannot be cleaned by routine procedures so degraded surfaces should be noted and protected so that cleaning will be avoided.

When decorative elements on an object are extensive and very delicate, refer cleaning to a professional conservator. Surfaces that have specialized finishes also may require exemption from cleaning. Figure S.5 describes cleaning techniques that can be considered for objects in good condition.

4. *How do I handle skin and hide materials?*

Much of the damage caused to leather and skin products is due to improper handling. Therefore, you need to train staff in proper handling techniques. See *MH-I*, Chapter 6, Handling, Packing, and Shipping Museum Objects, for general handling rules.

In addition to the general rules there are a few essential rules for the safe handling of these objects:

- Be prepared before handling these objects by having a clean area ready to receive the object. Arrange for assistance from others when necessary.
- Consider the weight of the entire object before lifting; aged and deteriorated fibers cannot tolerate much physical stress. Avoid suspending, creasing, and folding items.
- Move leather and skin artifacts on a tray support, in a drawer, or in a box; if direct handling is necessary, use both hands and support the object from underneath, not from original handles and straps.
- Accommodate the special handling requirements of appendages and decorative elements such as beadwork and dangles.
- Handle skin and hide materials only while wearing clean, cotton gloves; if hand contact is required, wash hands just before handling.

See MH-I, Appendix I, Curatorial Care of Archeological Objects, for a discussion of support trays for objects.

5. *What about catalog labeling?*

Marking and labeling leather and skin artifacts for cataloging purposes can present a number of preservation problems:

- The porous, absorbent nature of all skin products can cause labeling inks, paints and varnishes to be absorbed into the skin tissue causing irreversible staining and stiffening.
- The adhesives associated with commercial labeling tapes have poor long-term stability.
- Pressure sensitive tapes and embossed plastic tapes tend to fall off in time, and their adhesives are generally not removable from the skin.
- Any type of metal tag (including aluminum) or metal ringed tag can cause corrosion. Aluminum in contact with skin and hide materials causes dark spots on the surface of the object.

Cleaning Techniques	Tools	Caution
VACUUMING - This is the safest cleaning method, if carefully executed.	Use fine plastic screening and a vacuum cleaner with adjustable suction or a rheostat and a small standard nozzle attachment.	Screening between the leather and the nozzle protects the leather, but movement of the screen can also cause abrasion. Flaking surfaces and loose parts may be accidentally removed.
DUSTING - This is the most frequently used technique. It can be combined with vacuuming.	Use camel hair brushes.	Dust acts as an abrasive; each time a material is brushed, surface material may be removed. Brushing also increases the danger of knocking off delicate pieces.
FORCED AIR - Compressed air cleaning must be done outside the collection area or dust will simply be redistributed.	Use a compressor, air hose, and broad compressed air nozzle.	Loose or fragile pieces can be blown off if too great a pressure is used; 40 pounds/square inch is maximum.
ARTIST'S ERASER - This method can occasionally remove stubborn surface deposits from the grain side of firm, intact leathers and skins.	Use artist's block or powder eraser. (Testing has shown "Magic Rub" block and "Scum X" powder to be the least damaging.)	This technique is not useful on deteriorated surfaces or where skin or decorative layers may be susceptible to flaking. Remnants of the eraser may become deposited in textured surfaces and require vacuuming.

Figure S.5. Cleaning Techniques for Leather and Skin Objects in Good Condition

You can determine the specific labeling technique you will need by considering the individual object. Maintain consistency throughout the collection and use the least damaging method. Consider both indirect and direct labeling.

- Indirect labeling allows you to avoid irreversibly damaging the hide material with ink. The two recommended methods of indirect labeling are tie-on tags and fabric labels.
 - Make tie-on tags from high quality, acid-free paper products or inert plastic materials. Corners should not be sharp. Attach tags in a manner that does not cause undue stress, such as to an orifice, strap or handle. Use soft cotton string or a non-abrasive plastic loop for attachment.
 - If you can't label an object with a tie-on tag, use a fabric label, such as those made from cotton twill tape or non-woven spun-bonded polyester; these can be sewn to soft skin products using a beading needle and single strand, white cotton thread. You can usually attach these labels without passing completely through the skin, and you can limit stitches to the upper edge of the label. Attach at a seam or inconspicuous area of the skin or hide material, or loop to a permanent strap.

- Direct labeling on skin products can be recommended only for firm leathers and rawhide. You can apply a barrier coating or ground of clear Acryloid B-72 resin to a small, inconspicuous area (approximately 1 cm x 3 cm in size). When dry, apply the catalog number directly. The ink should have different solubility than that of the ground resin, so it may be changed if necessary.

See NPS Conserve O Gram 1/4, Use of Acryloid B-72 Lacquer for Labeling Museum Objects and the Museum Handbook, Part II, Chapter 3, Cataloging. In addition to normal health precautions, exercise additional caution when using solvents around leather and skin products because excessive amounts can cause deterioration.

Label the object neatly in the most inconspicuous place possible. Your labels should be small yet clearly readable from a distance of one foot. Use a high quality and iron-free ink, such as India ink.

6. *How do I provide adequate physical support for objects?*

Most organic materials lose their structural integrity as they age. Collapsed, creased, or folded materials will develop local weaknesses and damage if not protected by custom mounts and supports.

Use high quality, non-reactive materials:

- rigid acrylic sheeting
- acid-free matboard and unbuffered paper tissues
- washed and undyed cotton and linen fabrics
- polyester batting
- polyethylene foam products

Attached components can cause deterioration when in contact with other materials (such as metal parts). Separate components by a barrier of polyethylene sheeting or layers of acid-free tissue.

7. *How do I store objects properly?*

Store skin and leather objects in a space that is dedicated to the storage of museum collections, where climate control and security can be adequately controlled. Although storage requirements vary somewhat for individual leather and skin materials, basic conservation principles recommend that you provide a spacious and secure storage area, appropriate cabinets and containers, an area that is as free as possible from environmental threats, and individual storage supports. See *MH-I*, Chapter 7, Museum Collections Storage, for guidance on storage of museum collections.

The storage needs of tanned and untanned materials can be discussed at two levels. The first level addresses the overall collections storage facility with its system of shelving, cabinets, drawers, and trays. The second level focuses on individualized object supports. The following discussion provides more guidance based on these basic principles.

- **Provide Appropriate Cabinets and Containers**

- Protect objects made of skin products within cabinets or on shelving with dust covers. Items should not be piled, folded, squashed or leaned. Use cabinets and storage furniture made of metal with a baked enamel finish. Don't use wooden cabinets and shelving, because wood products emit damaging vapors.
- Use storage trays and containers to house and support individual objects as well as to reduce stress and damage during handling. Any material that directly contacts the specimen, such as boxes, tubes and tissue papers, must be of acid-free unbuffered paper. Limit your use of plastics to pure polyethylene, acrylic and polyester products.
- Vacuum and dust your storage areas regularly. Dust is acidic, abrasive and damaging to these materials. Routine and systematic housekeeping also lessens the chance of insect problems that can harm leather and skin objects.

- **Provide Individual Storage Supports**

- You will need custom supports for many leather and skin artifacts just as you do for other sensitive organic materials. As skin products age, they become more susceptible to damage resulting from the lack of physical support. Many three dimensional objects and most large objects (such as saddles) have additional requirements for either internal or external reinforcement.

Individual supports shouldn't constrict or interfere with the expansion and contraction of the skin materials, restrict the gain and release of moisture as the hide responds to environmental changes, be permanently attached to be object, or provide harborage for damaging insect pests.

- Use supports to provide specific reinforcement to all vulnerable areas that are prone to damage under the object's own weight or because of the limitations of the storage container. Disfigurement and folding of skin materials frequently leads to permanent deformity, the straining of fibers and eventual cracking.
- The design and materials (see page 16, item 6) you will use in your supports depends on the shape, weight and needs of the individual object. For instance, you can roll flat hides and robes around large diameter (minimum of 6" diameter) tubes. Store garments flat and stuffed with a light weight support to eliminate creasing. Place saddles on a rigid saddle tree or dummy support if fenders are likely to become deformed. See Figure S.6 for an illustration of how to construct a saddle mount.
- Hide objects can deteriorate because of poorly selected and inappropriate support materials. Harmful materials are those that emit damaging vapors and organic compounds.

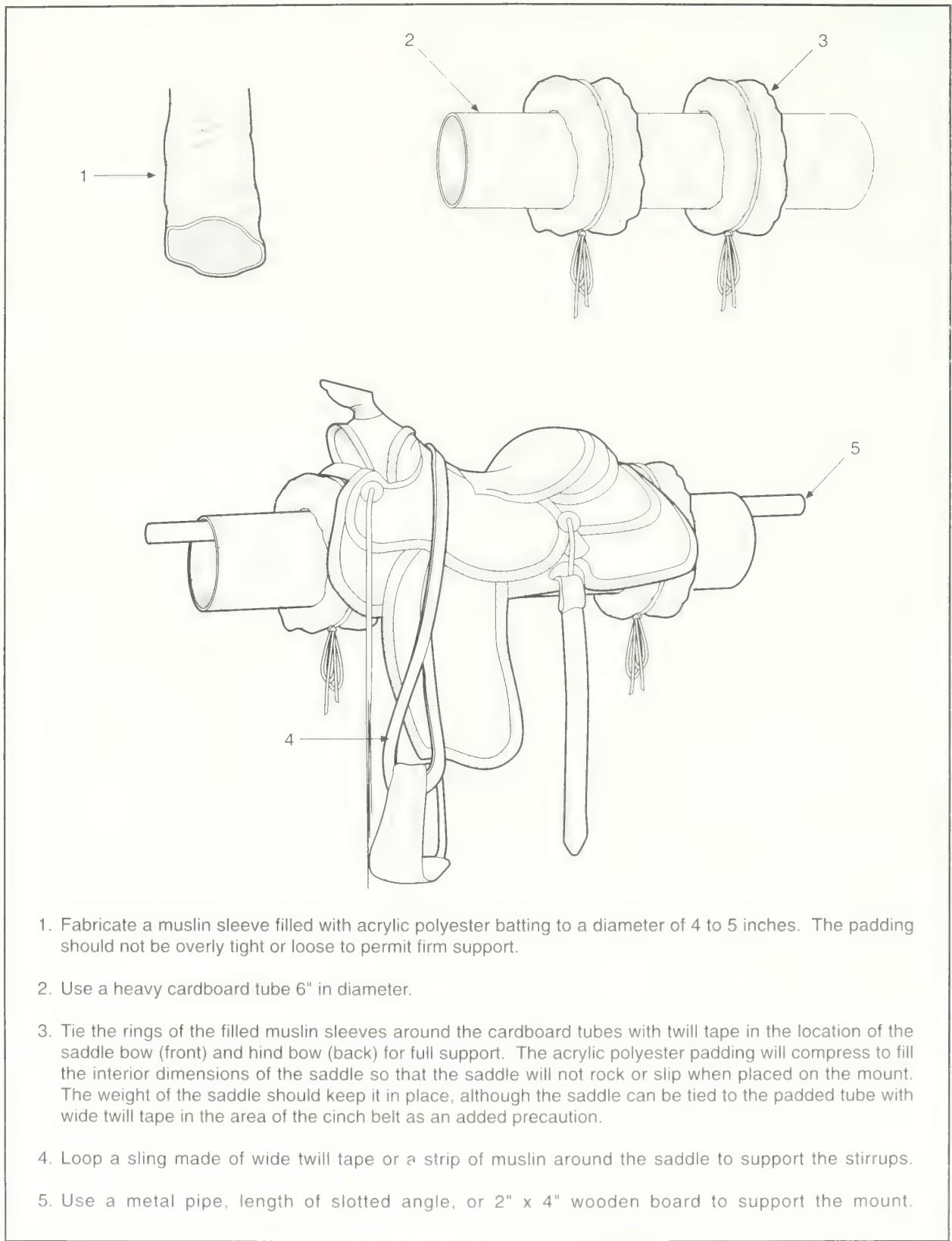


Figure S.6. Constructing a Saddlemount

E. Summary: Leather and Skin Product Deterioration and Preventive Care

The previous two sections discussed deterioration, the causes of deterioration, and ways to limit deterioration through preventive conservation efforts. Figure S.7 summarizes some of this information.

CONDITION	PROBABLE CAUSE	PREVENTIVE ACTION
Deformation (contraction, cockling, cupping, shrinkage)	Physical alteration during use, storage or exhibition..... Desiccation..... Alternate wetting or drying..... Excessive heating..... Photochemical reaction.....	Support in unconfined space Raise & stabilize ambient RH Use container to protect against humidity extremes Lower ambient temperature Filter UV radiation, lower visible light
Embrittlement (rigid, inflexible, brittle)	Disuse, absence of flexing..... Desiccation..... Soil impregnation..... Deterioration, loss of fat..... Detanning..... Photochemical reaction.....	None available Raise and stabilize ambient RH Use container, filter air Filter UV radiation, lower visible light Use container Filter UV radiation, lower visible light
Low cohesive strength (weakened, powdering, separating, fibrous)	Poor manufacture..... Mechanical abuse..... Chemical air pollution..... High acidity..... Oxidation..... Loss of fat or water content..... Photochemical reaction.....	None available Use container, eliminate handling Use container, filter air Use container, filter air, stabilize ambient RH None available Stabilize ambient RH Filter UV radiation, lower visible light
Physical Damage (abrasion, tearing, splitting, holes, missing parts, disjoined section)	Historic usage..... Inherent stress..... Dimensional movement..... Handling..... Stitching failure..... Adhesive failure..... Biological attack.....	Support, limit handling Support, limit handling Stabilize ambient RH Use container, limit handling Use container, limit handling Use container, limit handling Inspect, initiate control program
Soil or stain accumulation (oiliness water staining)	Use during historical period..... Improper handling..... Unprotected storage or display..... Unstable fat spew formation.....	Document, identify using remaining characteristics Instruct staff in proper handling, limit handling Use container, filter air Stabilize ambient temperature
Discoloration (fading, darkening, lightening)	Soiling or staining..... Excessive fat content..... Acid deterioration..... Photochemical reaction.....	Use container, filter air None available Use container, filter air Filter UV radiation, lower visible light
Loss of grain layer or exterior surface	Morphological feature of skin..... Poor manufacture..... Mechanical abuse..... Uneven consolidation.....	Use container, limit handling Use container, limit handling Limit handling None available
Loss of fur or hair (slippage, breakage)	Morphological feature of hair..... Poor manufacture..... Desiccation..... Insect attack.....	Use container, limit handling Use container, limit handling Stabilize RH Initiate periodic inspection and control program

Figure S.7. Leather and Skin Product Deterioration and Preventive Care

F. Conservation Treatment Issues

Curators, collectors, and conservators alike have been guilty of relying on old treatments to preserve skin materials, and far too frequently they accepted the promotions of commercial products designed for contemporary leathers. This history of haphazard treatment and unsystematic evaluation of skin products has resulted in considerable damage and loss. Common criticisms of past treatments of skin and leather products are that preservation attempts have not differentiated among the distinct categories of skin materials and have relied too heavily on the application of "preservatives."

The traditional remedies and reagents once routinely used in museum collections are now being carefully scrutinized by museum conservators. With the aid of scientific investigation and the assessment of the results of past treatment, several important new directions are being taken. The findings on past treatments have not been encouraging.

The routine application of preservatives (such as saddle soaps and leather dressings) is discouraged.

1. What are the perils of saddle soap?

There are many problems associated with the use of "saddle soap" on historic and artistic objects made from animal skin products. With the best of intentions, this commercial product has been inappropriately applied to just about every form of skin material in the past.

"Saddle soap" was not developed as a cleaner, but as a 19th century leather conditioner. Its basic components of neatsfoot oil and cod or sperm oil were emulsified with soap in water to produce an emulsion fat-liquor introduced during early tanning. As a conditioner, saddle soap is considered obsolete by tanners today.

Its application has caused considerable permanent damage to skin and leather objects since its components cannot be easily rinsed out and adequately removed (as manufacturer instructions often suggest). Saddle soap effectively softens and emulsifies surface oil and dirt, however it usually distributes them deeper into the material. The mixture's high moisture content presents a hazard to aged skin materials that should not be wetted, as well as light colored vegetable and/or alum tanned leathers.

Commercial formulations of saddle soap differ in their ingredients, some containing abrasives and even colorants. Saddle soap quality fluctuates greatly among manufacturers.

Perhaps most importantly, conservators now suspect that the surface cracking on many older skin and leather objects may well be due to past "saddle soap" application. Avoid it.

2. What are the drawbacks of leather dressings?

The care of skin and leather goods has traditionally involved the routine use of leather dressings, solutions of fats and oils that lubricate skin products to increase flexibility. Modern research has shown, however, that the haphazard use of dressings has been the cause of considerable deterioration within museum collections.

These solutions should never be applied to Native-tanned materials or objects comprised of untanned or semi-tanned skin products. Avoid the use of leather dressings on museum objects.

Numerous drawbacks are associated with dressing of skin products. For example, dressings frequently:

- darken lighter colored leathers
- encourage biological attack
- form fatty spews at the surface
- oxidize over time and stiffen the material
- wick into surrounding materials
- soften original finishes and decoration
- cause dust to accumulate
- impede future conservation treatment
- contaminate the material for future analysis

3. What about neutralization of acids?

The chemical decay and disintegration of leather resulting from exposure to acids is a well-known problem and its solution for older leathers remains unresolved. Vegetable-tanned leathers produced since the mid-19th century frequently exhibit a condition of internal fiber degradation known as "red rot." The color of the leather actually reddens as the deterioration progresses. In its advanced state, affected leather will disintegrate into a powdery form.

This condition is most always associated with sulfuric acid, introduced either during the tanning process or from atmospheric contact with the contaminant sulphur dioxide. (Leather readily absorbs acid from the air.) Sulphur dioxide, when absorbed, becomes sulphur trioxide, which unites with water to form sulfuric acid, resulting in a devastating effect on collagen fibers. Certain vegetable tannages (the ones categorized as condensed tannins) have been identified as being much more susceptible to this mechanism of deterioration.

Modern leathers are fortified against acid formation by incorporating buffering salts that repress acid formation and action. Some of the museum preservation literature during the last decade recommended that older leathers be treated with similar buffering salts, such as potassium lactate and potassium citrate, to protect them from acid attack.

The problem that museum curators face is that there is no easy and safe method for long-term neutralization of acids that are present in historic leather objects. There are *three* drawbacks associated with the treatment of leather with standard buffering salt solutions:

- The salts must be introduced in an aqueous solution yet water can be very damaging to historic leather causing stiffening, color change and disruption of applied finishes.
- Salt solutions are meant only for vegetable-tanned leather and will de-tan and damage mineral-tanned materials; the applicator must, therefore, be able to distinguish between them, which is not an easy task.
- The addition of buffering salts will do nothing for leathers that have already begun to deteriorate from acid exposure.

The conservation field is looking at other methods of deacidifying leathers; vapor phase reagents and non-aqueous chemicals are being investigated. The importance of this conservation issue is clear to those involved, and acceptable procedures should be available to museum staffs in the near future.

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